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MUNICIPAL ENGINEERING

VOLUME XXIV MARCH, NINETEEN HUNDRED THREE NUMBER THREE

PARKWAYS AND BOULEVARDS FOR PHILADELPHIA, PA.

By William B. Bray, Philadelphia, Pa.

Many of the most influential public and private citizens of Philadelphia are advocating a system of parkways and boulevards, which, if carried to completion, will rival any similar municipal improvement in the world. Their object is the making of The City Beautiful. How public interest in this extensive project has been awakened in Philadelphia will interest other municipalities desiring the same end. Opposition on the score of expense is rapidly disappearing in the face of the arguments presented by those advocating the various projects for beautifying the city, after delaying the adoption of plans for many years. Within a few weeks it is confidently expected that councils will have authorized the principal one of these improvements, viz., a Parkway extending diagonally from the city hall to Fairmount park. This encouraging outlook is largely due to the efforts of a few public-spirited citizens gifted with an eye for the artistic beautiful in municipal adornment and with a sense of the material advantages to the city that thus beautifies itself. The organization most effcetively advocating this Parkway movement is the Philadelphia Parkway Association, the successor or outgrowth of other private bodies that have favored similar improvements.

Beside the Parkway there are two other important plans for the city's improvements in the way of boulevards. They lie in far-separated portions of the city. Philadelphia, on the map, is broad at "the top," or northern section, and tapers at "the bottom," or southern section; at the confluence of the two rivers between which the city lies. It is nearly twenty miles in a straight line between some of these boundaries. Through the western and northwestern sections extends Fairmount park for a distance of ten miles.

To reach this park readily from the built-up sections of this vast city is one of the main objects considered in the construction of the Parkway, so-called, and the Southwest boulevards. The third project, viz, the Northeast, or Torresdale boulevard, will at first, perhaps, be more utilitarian, but will none the less prove an essential feature in the development of the city's natural beauty. This latter improvement has already been advanced so far as to be placed upon the city plan. It will be developed as time demands and opportunity affords. From these suggestions it can be seen that the movement on foot in Philadelphia for parkways and boulevards marks a long step forward in her municipal improvements. They are bound to lay the foundation for a greater and more beautiful city.

The Parkway plan is the main one in the public mind at this time and is before city councils in an ordinance introduced with recommendations from Mayor Ashbridge and the indorsement of the Parkway Association and other organizations. This plan is the outgrowth of a series of ideas brought forward during the past decade, and now seems to be approaching consummation. Councils survey committee has this ordinance in hand and is expected to report upon it for action within a short time.

According to the plan outlined in the ordinance and approved by the Parkway Association, the proposed thoroughfare will start from the City hall at Broad and Market-sts., the railroad and business center of the city. It will extend northwesterly to Fairmount park, with the site of the reservoir at the southernmost entrance of the park as the objective point. The Parkway will be one and one-eighth miles in length, nearly double that of the famous Unter den Linden of Berlin. For one-third of its distance, that is, from City hall to Logan-square, its proposed width is 100 feet. Beginning at the other side of Logan-square it is 300 feet wide to the park.

Plate 1 shows the plan proposed by the

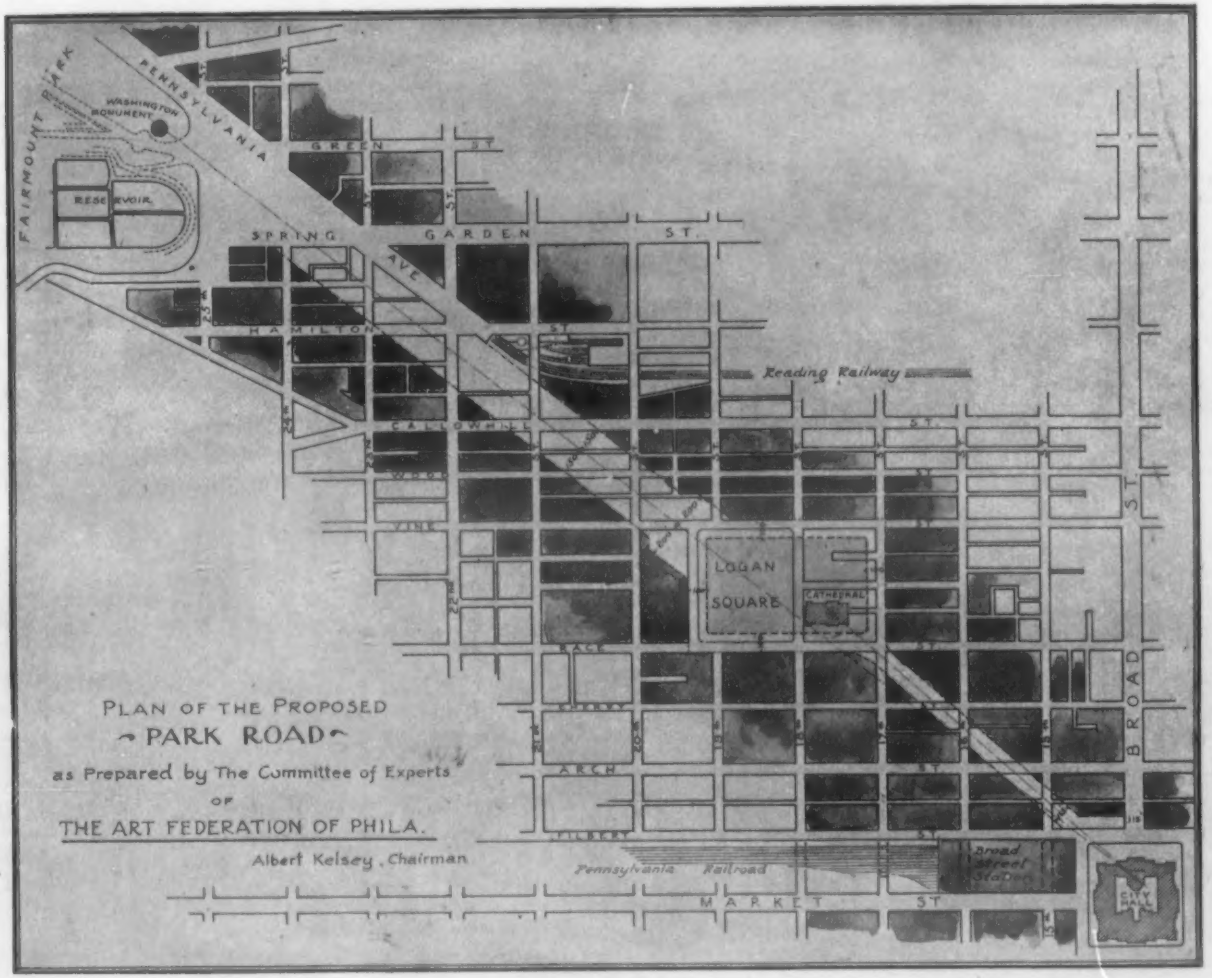
Art Federation some time since, and Plate 2 shows the plan now approved by the Parkway Association and before councils. It is somewhat elaborated from the first plan retaining its principal features. The 160-foot section will run through a thickly built-up portion of the city, mostly residential. Plates 3 and 4 show views from roof tops looking toward the city hall from points near the opposite corners of Logan-square. These buildings would all be removed to make room for the improvement. Logan-square will then be utilized as a site for architectural and landscape adornments. Other possibilities in the same line are contemplated for the Fairmount park terminus, which will broaden out into a plaza, with the Washington monument on the one side, possibly a proposed McKinley monument on the other, and, directly facing the Parkway, a magnificent art museum surmounting the present site of Fairmount reservoir. Such a building as the latter with the proposed environment, it is claimed, would produce an effect strikingly similar to the famous Acropolis at Athens.

One of the principal features of this Parkway plan in its entirety is its simplicity. Massing the features of the Parkway, roadways, walks, trees, and green sward, obtains broad effects. This is the French idea, adopted in most of their boulevards, notably the Bois de Boulogne, in which the artistic effects are produced by uniformity of design rather than by diversity, and the Boulevard de la Madeleine, a view of which is shown in plate 5. The Parkway would, therefore, probably have a broad roadway, unbroken from curb to curb. Then would come solid rows of trees on either side, edging the grass plots and granolitic paving. Then would come the buildings in keeping with the character of the thoroughfare and forming a framework for it. This idea, instead of subdivisions into walks and sunken gardens in the middle of the roadway, etc., is claimed by many of those most interested in the movement to be far more effective than an elaboration of designs in which bold and broad results are lost in a mass of detail.

The damages resulting from the condemnation of private property necessary for the Parkway are estimated at $5,000,000. This sum, it is conservatively estimated, would be returned to the city treasury in a few years from taxes on the increased valuation of property adjacent to the improvement. Instead of the wealthy residents of the city building their villas and handsome residences in the suburbs located in nearby counties, such a Parkway would, it is believed, induce them to choose sites along its route, erecting palatial homes, ornaments to the place and a benefit to the city in a financial way. A statement prepared by the Parkway Association gives some idea of how property values would be advanced by such an improvement and the income resulting to the city in taxes. It estimates an increase of at least $10 a foot in the value of property for 300 feet each side of the parkway for 24 intersections and the increase in frontage on the boulevard at $50 a foot. These, capitalized at 5 per cent., represent over $14,000,000 of new values. At the present tax rate of $1.85 this would produce $259,000, the interest at 3 per cent. on $8,000,000 of a city loan, a large excess over the estimate of damages. Increases in values beyond the limits stated, of corners, and future increase in value of boulevard property are not included in this estimate.

The general development must be worked out in the future. Plate 7 shows the comprehensive plan prepared by William J. McAuley, an architect, which has been approved so far as it provides for a 160-foot avenue to Logan square and a roadway 300 feet wide from there to the park. The entire McAuley plan is too elaborate for the financial possibilities of the city at this time, but it is recognized as an artistic conception on a magnificent scale of what could and in future years may possibly be done. Legislation would be necessary to require conformance of buildings and grounds or to authorize the condemnation by the city of property on each side of the boulevard proper for several hundred feet, thereby giving to the municipality the control of the character of the buildings to be put up on the land, whether leased or again sold.

In the McAuley plan the narrower portion of the Parkway would be divided into 84 feet of driveway, two 12-foot bridle paths shaded by trees, and two Malls, each 26 feet in width. The next section of the Parkway would include Logan Square with the imposing domed Catholic Cathedral, to be transformed into a circular park, 450 feet in diameter, ornamented with marble peristyles on two sides of the proposed million-dollar soldiers' monument, for which a design has already been adopted by City Councils. What with the lakes, electrical fountains, bridges and walks, this portion of the Parkway could be made the most artistic feature of the entire improvement. The space required between property lines and buildings would leave about 700 feet between structures on opposite sides of the Park. The last section, from Logan Square to Fairmount Park, would differ from the first section principally in a stretch of green sward, 70 feet wide, extending down the center with driveways on each side. Sunken



1. ART FEDERATION'S PLAN.

gardens, walks and water pools would enter into the details of the construction. In this or any plan which may become a reality a profusion of trees will enhance the beauty.

Plate 7 and the detail of the Logan Spuare and upper section in Plate 8 will show many other beautiful suggestions made by Mr. McAuley.

A brief history of the movement for the Parkway is of interest. About eleven years ago an earnest plea was made for establishing a plaza at the northwest corner of City Hall to show off that massive and imposing structure, which is gradually being hidden by a cluster of sky scrapers, preventing an adequate view of its architectural beauties. Hon. James M. Beck published an argument for this plaza, presenting the subject with convincing clearness from a standpoint of comparison with similar projects in other large American and European cities. An ordinance was introduced but accomplished nothing. Mr. Beck pointed out what Philadelphia has since learned with regret, that delay only adds to the value of needed property. In his plea for the establishment of a plaza and also for broad avenues, wide streets and boulevards, he contended as follows:

First. They are necessary for the beautification of a city.

Second. They should be established in a city's early history so as to secure them at moderate cost.

Third. They are desirable because of the great material advantages accruing to a city and its inhabitants from such improvements. He showed the cash returns realized by every European city wise enough to adorn itself with all the natural and artistic resources at its command. Each has been an hundredfold repaid for its outlay by attracting a continual current of world travelers who spend their millions in admiration.

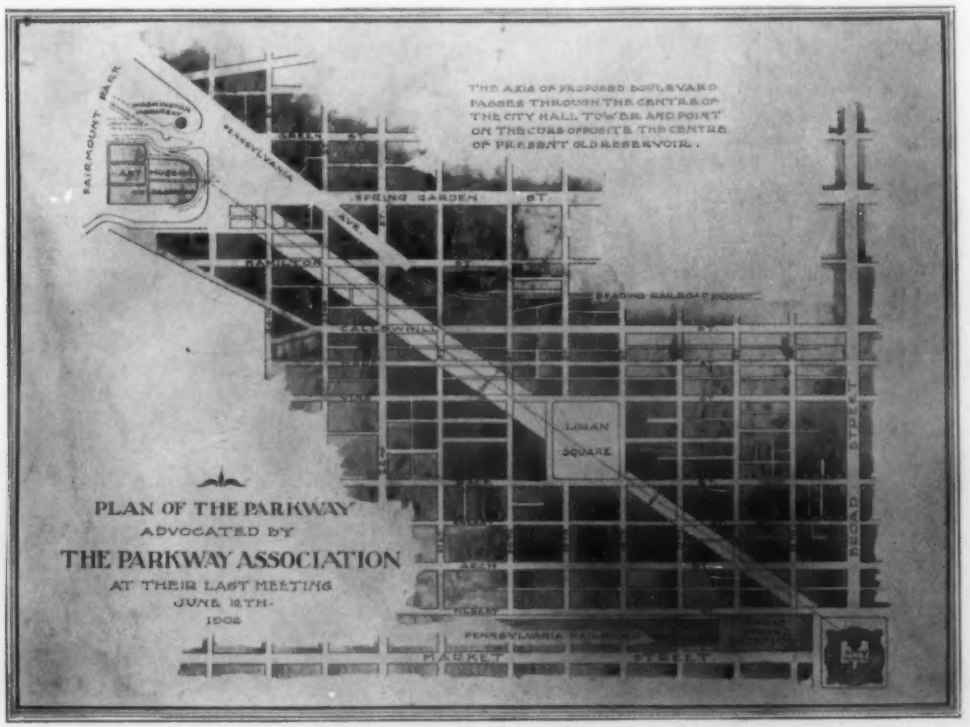
After the subsidence of activity over the plaza movement the subject was revived from time to time by City Councilmen and others proposing plans for ziz-zag boulevards from City Hall to the park. These were not seriously considered because they would perpetuate the gridiron system of streets that prevails in Philadelphia. The rigid adherence to this system is often criticized as inimicable to a city's development by preventing cohesion of its scattered parts and thus tending to create sectionalism.

The next idea presented was that of a straightaway diagonal boulevard. This was advocated by the Art Federation organized three years ago by representatives from a score of art, scientific, educational and engineering clubs and civic institutions. They appointed committees on boulevards and experts on plans out of which grew, as has been stated, the projects already described. These representative citizens, standing for the highest artistic sense of the community, interested in their cause mayors of the city during two administrations and other officials. Among the most active members of this organization was Albert Kelsey, now secretary of the Parkway Association, but then chairman of the committee of experts on plans. Mr. Kelsey prepared the plan making use of Pennsylvania-ave. as a part of the boulevard approaching the park entrance, also having as a feature of it a line of axis running from City Hall directly to the cathedral in Logan-square, shown in Plate 1. The plan now approved, Plate 2, is but a slight deviation from that one.

The Art Federation having failed to bring about the adoption of its plan, the Parkway Association sprang into existence and includes practically all of the active members of the former organization. It enlisted among its most efficient members the following influential citizens on its executive board: President, John H. Converse, head of the Baldwin Locomotive works of the city; Justus C. Strawbridge, a prominent merchant; ex-Judge Samuel Gustine Thompson, a member of the Fairmount Park Commission; and the Hon. James M. Beck; also as members of the board, P. A. B. Widener, a well known financier; A. J. Cassatt, president of the Pennsylvania Railroad; James Elverson, proprietor of the Philadelphia Enquirer; Thomas Dolan, a prominent financier; William F. Harrity, a lawyer and formerly postmaster of Philadelphia; William M. Bunn, formerly governor of Idaho and Secretary Albert Kelsey. The association has spent much time and money in circulating literature to create public and councilmanic sentiment in favor of the project.

Another organization which had earnestly indorsed and advocated the movement is the City Parks Association which has in the past few years succeeded in inducing the authorities to dot the city with small and large parks. This association welcomes the parkway and boulevard projects as aids in its work.

The South Philadelphia and Northeast boulevard propositions have been undertaken in time to make their cost comparatively small. The Torresdale or Northeast boulevard, already on the city plan, starts from Broad-st. about four miles north of City Hall. It runs northeast through undeveloped territory, touching suburbs at present remote from the main arteries of travel and therefore isolated from the city proper. This boulevard will be a business thoroughfare as well as a magnificent avenue. A trolley line,



2. APPROVED PLAN BEFORE COUNCILS.

perhaps a subway, will extend throughout its course, a charter for such a subway having already been granted by the state. The construction of the boulevard, it is estimated, would not cost over $5,000,000, and will probably be provided for next year. The engineers of the city survey bureau are now at work on the plans, and the first two miles of the boulevard have been staked off. The three hundred feet between the house lines on either side of the thoroughfare will be divided into thirty feet of footways on either side, then thirty feet asphalted or macadamized for business traffic, then, separated by a hedge, a bridle path sixteen feet wide covered with earth and tan bark for pedestrians; then a driveway thirty feet wide shaded by trees on each side; in the remaining eighty-eight feet a double line of trolley cars to be located. Either business or pleasure traffic may find a place also beside the car tracks, unless the railway company adopts the suggested plan of rnnning the cars in an open subway with sloping, grass-covered banks. This magnificent thoroughfare will be ten miles in lengtn, almost straight.

The City Park Association has suggested, among other improvements for developing that section of the city, the preservation of the Tacony Creek valley and the establishment of Juniata park at its eastern terminus. The same association has suggested the ornamentation of the Broad-st. terminus of the boulevard by constructing there a circle with a monumental shaft in the middle, and other avenues from distant sections converging at that point.

The system of boulevards in the southern section of the city would provide a beautiful drive from Fairmount park to League Island park, recently established adjacent to the navy yard, from which it takes its name. This chain of boulevards would extend around the Southwestern boundary of the city for several miles. At the junction of Broad-st., the longest paved street in the world, and the southern end of this series of boulevards, a system of diverging diagonal avenues one hundred and sixty feet wide is being advocated by the City Park Association, which is really the projector of almost this entire South Philadelphia improvement. An ordinance for this latter improvement is now in the hands of a council committee, which will go over the scene within a few days before reporting on it. The manner of construction of these parkways and boulevards has not yet been determined. They will probably be paved with asphalt or will be partially macadamized.

HOW TO LAY INTERURBAN TRACK IN CITIES.

A correspondent who is city engineer in a city of moderate size gives a statement of the conditions in his city with reference to the condition of the street railway tracks and asks what can be done to improve it. The following, selected from his letter, gives the points of difficulty upon which discussion is desired by readers of this magazine who have had any success in treating the various troubles which he mentions:

"We are experiencing considerable trouble with our pavements between the rails of the street car line. We are using the 6-inch Shanghai T-rail. It has heretofore been the practice to ballast the track with crushed stone. My experience with track work is that crushed stone is a treacherous ballast, especially under a track on a paved street in care of inexperienced men. We are using a brick 4x6½ inches in longest dimensions, with the corner next the rail beveled, omitting a section 2½ inches along the length of the brick and 2.1 inches along its depth.

"Our greatest trouble is found along the tracks used by the interurban cars. These cars, when empty, weigh 31 tons and 800 pounds, and, the motors being hung on the front trucks, give, also considering the weight of heater and controller on the front end of the car, a concentrated load of about 24 tons on the front truck. The flanges on the wheels, when new, are ⅞ inch, and, no doubt, before many a wheel is discarded, the tread has been worn so that the flange is near 1¼ inch, and here is where the trouble begins. As soon as the flanges begin to touch the brick the latter begin to break and the inside of the flange begins to lift the brick, thus giving a place for the water to get under them. In mild weather this water softens the foundation and causes the track to settle, and in cold weather this water freezes and raises the brick.

"I should like to know the practice in other cities where a T-rail is used as to foundation under street tracks; as to the kind of nosed brick used, if any; as to the top surface of the brick between the rails, whether level with top of rail or slightly below; as to brick laid at right angles to rails or parallel, between rails and tracks; as to size of ties used generally in cities.

"The interurban company has a franchise relieving them of all street improvements and here lies the bone of contention. In making out specifications for

8. ROUTE OF PHILADELPHIA PARKWAY FROM ROOF TOP NEAR SEVENTEENTH AND RACE STREETS.

street improvements where the company's lines are, the property-owners object to paying for concreting under and around the street car tracks while crushed stone is used on other parts of the track. For the benefit of cities and towns having franchises to grant to electric lines I suggest a clause in said franchise to the effect that when streets are to be improved over which the company's cars operate the street shall be improved its entire width and kept in repair under the direction of the city or town, and the company shall pay for that part of the improvement and repair that is occupied by their tracks. I should be glad to know in what other cities the conditions described exist."

There are several subjects presented in this letter which it is well to consider separately and discussion by our readers is invited under the following heads:

1. The foundations for street railway tracks. So long as the pavement is comparatively light and loose in its character, as is the case with macadam and gravel streets, the character of the foundation is not of great importance, except as it affects the expense of keeping the street in repair. The letter suggests the necessity of perfect drainage of the street foundation and this is essential. Both cities and street railway companies have been experimenting, but neither seems to pay sufficient attention directly to the detail of keeping water out of the foundation. The continuous concrete stringer which is used in some cities, with the cross-ties of wood and iron, distributes the weight of cars so that water in the foundation does not affect the alignment of the track so much, but when it does the effect is more serious. Water will get into the foundation whenever the continuity of the surface is broken by its expansion and contraction or by the vibration due to traffic, so that some system of channels, more or less open, to lead this water away should be provided. Crushed stone may be made satisfactory if the water getting into it can be led away before it reaches the earth beneath. The writer suggests a layer of crushed stone or gravel, whose interstices have been made water-tight with bituminous material. This may be placed in part of the layer or the entire bed of crushed stone may be filled with it. In either case its surface should be so graded that the water reaching it can be led away to drains properly located to discharge well away from the roadbed—into the sewer if there is one. In that case the bed of stone may be thinner than is customary. The new bituminous macadam pavement suggests this treatment and the form of bitumen used in it seems to be well adapted to the purpose. A perfectly rigid foundation is not so satisfactory as one with some elasticity, but it is often assumed as an essential on account of the difficulty of retaining the pavement in place along the rails. With such a water-tight foundation as the one suggested, the bricks or blocks which have proved to be the most satisfactory paving next to the rail need not be laid with water-tight joints and it may be possible to permit a little elasticity without entirely destroying the pavement, displacement of blocks by the permitted movements being easily remedied, but requiring frequent inspection and replacing before the materials are injured by vehicles or car wheel flanges. Gravel, broken stone, concrete under ties, concrete steel ties and continuous concrete stringers are all in use. Their expense and the satisfaction they give increase in the order named.

2. The proper material and method of laying for pavement next the rails. This may be considered in general, but with special reference to the T-rail. The question of depth of flange on the wheels of interurban cars is one of much importance which has not yet been very seriously considered. The ordinary street railway flange is about ⅞ inch, but the development of high speed is showing the necessity of a deeper flange for interurban cars. A deeper flange cannot be used in cities having the ordinary center or side-bearing rail, whether flat or grooved, on account both of the low head of the rail and the design of the sharp curves at street corners. Separate tracks for interurban lines and T-rails on their routes within the city have both been suggested. The question will soon come up for settlement. The increase in flange depth, whether by construction or by wear, will bring the same problems. If the brick surface between the rails of each track could be laid far enough below the tops of the rails there would be no trouble from the wheel flange, but a surface say 1½ inches below the general level of the street would be very objectionable, whether a plane surface or crowned to the center of the track. It would be an obstruction to travel, especially that crossing the track at a slight angle, and it would turn the water to the rails where open joints are certain to occur, thus letting the water into the subgrade and softening it. In a level street where the experiment was tried, the asphalt being level with the rail flange, a canal was formed in which the water stood until it leaked away, sewer connections being inserted finally at the lowest spots to carry away the accumulating water.

With flat rail flanges, the Buckland

4. ROUTE OF PHILADELPHIA PARKWAY FROM ROOF TOP NEAR TWENTIETH AND VINE STREETS.

paving block seems to make a successful junction between rail and pavement. It is an iron casting, with a groove to slip over the lip of the rail and ridges on its upper surface for foothold. The block or sheet pavement holds the blocks in place. A groove is formed next to the rail, which is of form to permit ready exit of wheels of wagons, and the only water collecting between the rails is that running in this groove. A large block bearing on the web of the rail might be devised for use with the T-rail. In Minneapolis the most approved form of track construction includes concrete stringers under rails, steel tie bars between rails, concrete foundation under pavement, T-rails set in concrete, a granite block set inside the rail, its top flush with the top of the rail and the rest of the pavement, and set far enough from the rail to give the proper width of groove. The block is set in concrete and was kept the proper distance from the rail by a wooden strip while the pavement was under construction. This strip was afterward removed and the lower half of the five-inch depth of the space was filled with cement grout. The upper half, to the top of the rail, was filled with asphaltic cement, 30 per cent. asphalt and 70 per cent. limestone dust. This mixture is soft enough to cut under the flanges of the wheels to make the proper flange way.

The construction of this block and flangeway could doubtless be modified to suit the water-proof broken stone foundation and the brick wearing surface proposed above. The width of the groove can be made whatever is necessary for the depth of wheel flange used and it would probably be necessary for stability of the blocks to make them deeper than the four inches which is the usual depth of a brick for street paving.

Some of the paving brick manufacturers make special forms of brick to lap under rail flanges, but with T-rails they have the same troubles described by our correspondent, and they are not deep enough to get the bearing on the web of the rail which is necessary for the utmost stability.

The practice in several cities seems to have shown that one or two rows of brick next the rails should be laid parallel with them. In some cases all the bricks between rails and tracks are so laid. This is not very objectionable when poles between the tracks or other circumstances turn traffic so that it is always crossing the tracks and not traveling on them, but where wagons especially not with the same tread as the tracks travel frequently along the tracks, as is the case in narrow, well traveled streets, even the row or two of bricks parallel to the track and next the rail is objectionable. Under ordinary circumstances the double row next the track, the other bricks being laid at right angles or diagonally, is the most satisfactory.

The ties used are ordinarily 5 or 6 by 7 or 8 inches by 7 or 8 feet long. The tie 6 by 8 inches by 7 feet is usually considered the standard.

3. As to requirements regarding paving to be inserted in street railway franchises. The question of interurban railway franchises in Indiana was considered in an article in Municipal Engineering, vol. xxi, p. 218. It is there stated that Indianapolis and Fort Wayne may require paving between rails and 18 or 12 inches outside, respectively; Hammond requires street railway company to pay its share of cost of macadam or other street paving; Seymour and Alexandria have no paving requirements; South Bend requires paving when the rest of the street is paved. In Elwood the interurban company succeeded to the franchise of the local company requiring paving of tracks with brick. The necessity of contract provisions regarding paving is emphasized in the article.

Other discussions of the subject will be found in vol. xxii, pp. 16, 26, 34, 220 and 247.

In Illinois, Evanston and Danville seem to have no paving requirements. Moline requires paving, macadamizing or graveling of tracks and payment of cost of pavement to abutting property-owners for area disturbed in laying track in streets paved before the track was laid. Galesburg requires paving when rest of street is paved, to be done under supervision of City Engineer.

In Ohio, Ashtabula, Findlay, Lima, Piqua and Dayton require paving of tracks and 12 to 18 inches outside or that the railroad shall pay its share of the assessment of cost. Lorain has no provision regarding paving.

In New York, Dunkirk and Utica seem to have no paving provisions; in Rome the company must pave and maintain with same materials as remainder of street.

In none of the cases where street paving is required are there special provisions regarding construction under tracks. Some require that the surface between tracks shall be kept in good repair and some that it shall never be more than one inch below the rail top.

It is, of course, very difficult to insert a provision regarding paving in a street railway contract if it has been omitted from the original grant, and a provision such as that proposed by our correspondent should therefore be inserted in the first ordinance, and should certainly be added at the first opportunity if not now

5. BOULEVARD DE LA MADELEINE, PARIS.

in. Whether the company should be held responsible for the condition of its tracks under a provision requiring it to pave and maintain in a satisfactory condition, or should be held responsible for the payment of cost of paving and maintaining under a provision authorizing the assessment of the railway's portion upon it, is a question for determination in each individual case. Both methods are in use.

In the past it has not been possible to assess any part of the cost of street paving against the street railway company unless the franchise of the company expressly authorized it, but there seems to be a change in the opinions of the courts which indicates a disposition to consider more favorably the rights of the owners of property abutting on the street. This has not yet borne fruit in the shape of decisions. That the street railway company is benefited by the pavement cannot be denied. Its privileges lay burdens upon adjoining property in the way of increased cost of paving and upon the city in increased cost of repairs which it is but just the railroad should pay, but at present the only way of assessing these benefits upon the railroads is by provisions in their franchises. Cities petitioned for such franchises should not permit the benefits from the new lines to overshadow the damages to a portion of its citizens sufficiently to obscure the necessity of inserting provisions giving it the power of requiring sufficient paving and maintenance thereof when the necessity for it arises.

INCANDESCENT STREET LIGHTING.*

By Alton D. Adams, Boston, Mass.

Incandescent electric lamps were used for street lighting in twenty-three cities of Massachusetts during the year ending June 30, 1895, and in 1901 in twenty-seven. The following table presents the average daily number of these lamps in the several cities for 1895, 1898 and 1901. Boston leads the list in the earlier year with 1,304 incandescent street lamps, but in 1901 Lynn, with 1,199 lamps, had the largest number. Twenty-one cities had more of these street lamps in 1901 than in 1895, and six cities had smaller numbers. Cities of medium size, namely, Lynn, Newton and Malden, are much the largest users of incandescent street lamps at the present time.

AVERAGE YEARLY NUMBER OF INCANDESCENT STREET LAMPS.

	1895.	1898.	1901.
Boston	1,304	14	14
Lynn	1,211	1,160	1,199
Newton	820	771	966
Malden	724	862	1,023
Salem	613	623	358
Lawrence	548	575	603
Brockton	438	335	223
Melrose	340	432	507
Everett	321	402	578
Medford	317	480	538
Pittsfield	302	460	536
Woburn	303	318	340
Cambridge	222	361	434
Somerville	208	209	275
Quincy	173	333	417
Chelsea	192	206	205
Marlboro	150	188	217
Springfield	140	22	72
New Bedford	33	66	69
Gloucester	40	412	564
Worcester	40	45	10
Newburyport	11	7	12
North Adams	4	....	36
Waltham	....	50	164
Northampton	....	....	17
Lowell	....	....	16
Haverhill	....	....	2
Total lamps	8,353	8,331	9,398

*Copyright, 1903, by Alton D. Adams.

A circle with a radius of ten miles and Boston as a center includes cities that were using 6,243 incandescent street lamps in 1901, or 66 per cent. of the number in all of the cities.

Incandescent lamps of 25 nominal candle power are now used more generally than any others for street lighting, but there is a range in different cities from 15 to 65 candle power. During the year of 1901, sixteen of the twenty-seven cities used incandescent street lamps of 25 candle power and the number of these lamps was 7,191 or 76 per cent. of the total number.

Incandescent street lamps of 25 candle power were used exclusively during the fiscal year of 1901, in the cities of Chelsea, Gloucester, Haverhill, Lowell, Everett, Malden, Medford, Melrose, Marlboro, Newton, Northampton, Pittsfield, Quincy, Springfield and Woburn. At Boston Newburyport and Worcester incandescent lamps are 32, at Lawrence all are 20, at North Adams all are 40, at Salem all are 30, at Waltham all are 24 candle power. In Cambridge 160 lamps were 32 and the remainder were 40 candle power. In Brockton 3 lamps were 65 and the remainder were 15 candle power. At Lynn 6 lamps were 32 and the remainder 25 candle power. In New Bedford one lamp was 50 and the others were 16 candle power. In Somerville 273 lamps were 32 and the others were 25 candle power.

Wide differences exist between the number of hours per year that incandescent street lamps are operated in different cities. Thus in Springfield these lamps were in use 11.8 hours per day and 30.4 days per month on an average during 1901. In contrast with these figures the lamps at Northampton operate only 4.9

6. PASEO DE LA REFORMA, MEXICO CITY.
Showing Foot and Driveways, Lawns, Monumental Seats and Pedestals.

hours per night and 25.8 nights per month on an average.

Much the most satisfactory method of comparison of the amount of service actually received per incandescent street lamp is that based on the energy consumed yearly in each lamp. For a given ratio between required watts and candle power in such lamps, the total energy per lamp depends on the candle power and on the hours of operation. The general, normal rating of incandescent street lamps is 3.5 watts per candle power. On this basis the table of kilowatt hours consumed per incandescent lamp in each city has been computed for the fiscal years of 1901.

It is very evident from the results in this table that a mere statement of the number of street lamps used in any city may give a very inaccurate idea of the amount or value of the service rendered. Thus in Cambridge each incandescent lamp of 40 candle power consumed 546.4 kilowatt hours during the year, while in Woburn each lamp of 25 candle power consumed only 120.7 kilowatt hours. Striking differences in the energy consumed per lamp yearly are not confined to those of different candle powers. In Springfield a part of the 25 candle power lamps consumed 376.6 kilowatt hours each during the year, while in Northampton lamps of the same candle power consumed only 132.7 kilowatt hours each for the same period. In each case the number of kilowatt hours given per lamp represents the product of the nominal candle power, 3.5, and the number of hours of operation during the year, divided by 1,000 to reduce watt to kilowatt hours. Where lamps of different candle powers or having different periods of operation are used in the same city, the kilowatt hours given refer to one of the class of lamps that require the larger amount of energy each. Though the kilowatt hours per lamp are given in the table for only one year, they have been computed for each year since 1895, so as to determine prices.

KILOWATT HOURS PER INCANDESCENT STREET LAMP:

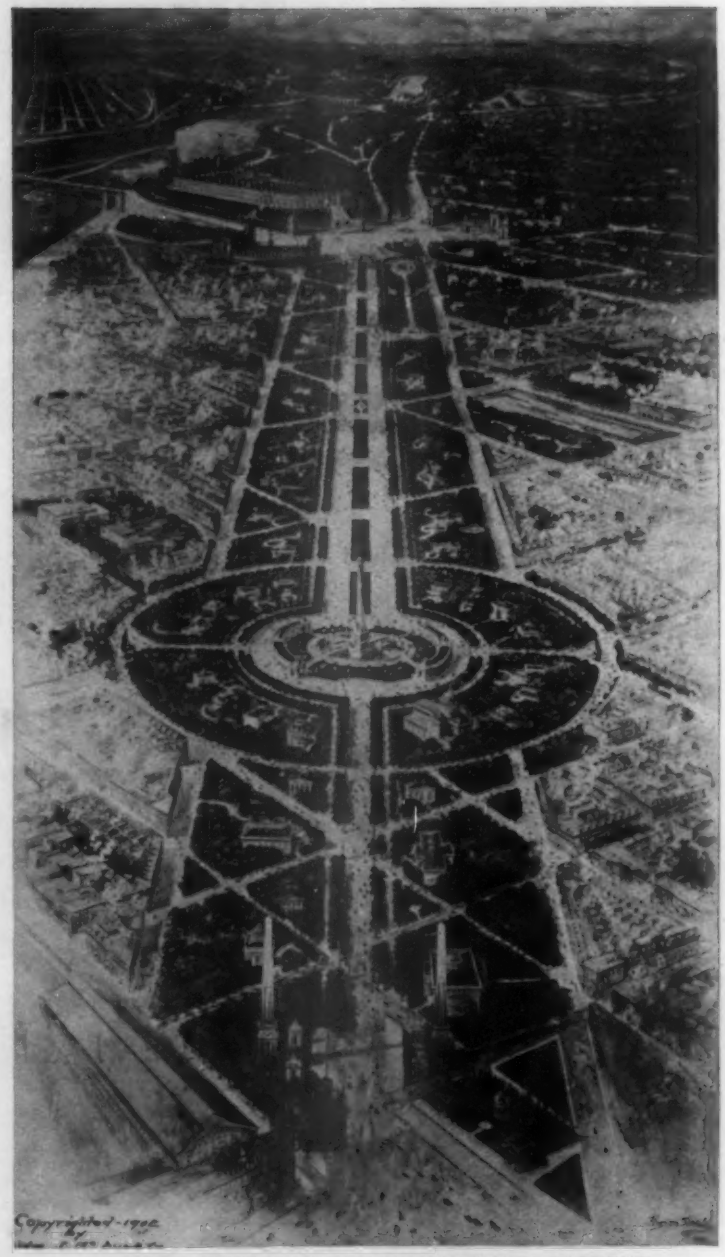
Boston	429.0	Quincy	159.2
Lynn	269.4	Chelsea	351.1
Newton	204.2	Marlboro	207.4
Malden	257.5	Springfield	376.6
Salem	402.1	New Bedford	178.2
Lawrence	273.2	Gloucester	147.0
Brockton	369.1	Worcester	429.0
Melrose	150.2	Newburyport	197.5
Everett	150.2	North Adams	554.8
Medford	147.4	Waltham	141.1
Pittsfield	335.1	Northampton	132.7
Woburn	120.7	Lowell	344.7
Cambridge	546.4	Haverhill	277.8
Somerville	423.6		

Contract prices for the service of incandescent street lamps are usually fixed by the year. In order to make a comparison of such prices paid by the cities of Massachusetts from 1895 to 1901, inclusive, the sum paid per lamp for each year or other period of service is divided by the number of kilowatt-hours consumed by the lamp during that period. In this way the table of prices for each year has been constructed. Comparing prices in the earlier with those in the later years, it appears in the majority of cities the rate per kilowatt-hour has either remained nearly constant or has declined. In several instances, as at Newton, the price charged in 1901 was higher than it was in 1895. Notable differences exist in single years between the rates in the various cities. Frequently the rates shift in amount from year to year, first higher, then lower and then higher again.

CENTS PER KILOWATT-HOUR PAID FOR SERVICE TO INCANDESCENT STREET LAMPS BY CITIES OF MASSACHUSETTS:

	1895 Cts	1896 Cts	1897 Cts	1898 Cts	1899 Cts	1900 Cts	1901 Cts
Boston	13.2	11.3	....	10.2	10.2	10.2	10.2
Lynn	7.7	7.6	7.7	7.4	6.5	5.5	6.7
Newton	5.8	4.4	7.8	8.1	7.8	7.8	7.5
Malden	...	...	6.3	9.7	8.8	8.6	7.7
Salem	7.5	7.0	5.3	5.5	5.5	5.1	5.4
Lawrence	11.0	10.5	10.3	9.1	9.4	9.1	8.7
Brockton	...	...	13.4	5.9	11.0	6.1	12.1
Melrose	15.1	16.8	13.7	13.4	11.3	11.1	10.3
Everett	13.4	16.0	11.0	12.0	11.5	11.0	10.3
Medford	...	10.8	12.8	12.6	11.1	11.1	10.5
Pittsfield	8.2	6.6	7.1	7.1	7.1	7.3	6.7
Woburn	12.3	11.9	11.5	11.7	11.3	11.6	12.5
Cambridge	6.8	6.8	5.4	5.6	5.8	5.4	5.4
Somerville	7.4	7.4	7.4	7.4	7.4	6.9	7.0
Quincy	13.9	13.8	14.2	13.8	14.9	13.3	11.6
Chelsea	9.1	....	7.4	7.5	7.1	7.1	7.1
Marlboro	8.3	8.4	8.2	8.4	13.7	8.4	8.4
Springfield	7.0	6.8	7.0	5.4	5.3	4.8	6.3
New Bedfo'd	13.8	14.5	14.3	13.5	13.7	12.5	10.4
Gloucester	12.2	15.0	....	11.2	11.6	11.6	10.5
Worcester	7.3	7.1	5.6	5.5	5.5	5.5	5.5
Newburyp't.	....	....	16.0	17.8	17.5	16.7	15.2
North Ad'ms	....	5.5	5.5	6.8	7.9	7.8	8.6
Waltham	....	13.6	13.9	14.1	13.4	12.5	13.6
Northampt'n	....	....	20.6	....	....	18.7	17.0
Lowell	....	....	....	....	....	....	5.2
Haverhill	....	....	....	....	....	7.7	9.0

In the year 1901 the lowest rate for street lighting with incandescent lamps was 5.2 cents per kilowatt hour, and this rate was enjoyed at Lowell, where only sixteen of these lamps were in use. At Northampton, where there were seventeen lamps, the rate was 17.0 cents per kilowatt hour, the highest paid in any city. Lynn had 1,199 incandescent street lamps during the year in question, a larger number than any other city, and paid 6.7 cents per kilowatt hour, a price higher than those in five other cities. The lowest rate in any city during the series of years was 4.8 cents per kilowatt hour at Springfield, Ill., in 1900, and the highest rate was 20.6 cents at Northampton in 1897. During 1901 one city paid 17 cents, one paid 15.2 cents, one paid 13.6 cents, one paid 12.5 cents, one paid 12.1 cents, one paid 11.6 cents, six paid 12.1 cents, one paid 11.6 cents, six paid between 10 and 11 cents, four paid from 8 to 9 cents, four paid between 7 and 8 cents, three paid be-



7. THE McAULEY PLAN FOR PHILADELPHIA PARKWAY.

tween 6 and 7 cents, and four paid between 5 and 6 cents per kilowatt hour. In the four cities having rates between 5 and 6 cents the numbers of incandescent street lamps were 358, 434, 10 and 16, respectively, while the kilowatt hours per lamp, taking the cities in the same order, amounted to 402.1, 546.4, 429.0 and 344.7 during the year.

From these facts it appears that the lowest rates for incandescent street lighting are found neither in cities having the largest numbers of lamps, nor in those where each lamp consumes the greatest amount of energy yearly.

In general, the range of rates per kilowatt hour for service to incandescent lamps was not far from the like range for service to arc street lamps. For arcs and incandescent lamps alike the lowest rates were between 5 and 6 cents per kilowatt hour during 1901. The highest rate of 14 cents per kilowatt hour for arc lamps was exceeded in only two instances for incandescent service. Of the thirty-one cities purchasing arc service, twenty-seven also employed incandescent street lamps.

HYDRANT RENTAL.

By D. H. Sawyer, New York City.

The charge for hydrant rental is of importance to both the private water company and the municipality paying it. Cities pay large sums for fire protection by water works, but so far as the writer knows there has been little effort to determine what hydrant rental is just.

When a water company applies for a franchise to supply a town with water it seeks to install a large number of hydrants on the system and to receive as large a yearly revenue as possible. In few cases does the company itself know what is a just charge, its only basis being those made in similar localities under similar conditions. The ordinary town is equally helpless. In not a few cases the rental of hydrants is made a bonus for the water company to encourage the construction of the works. This is most frequently done where the city is small and the prospective receipts from other sources not promising, or where the development of a supply or other unfavorable conditions make the installation unusually expensive. In cases of this nature the equitable charge is not sought, but merely that which may prove satisfactory to both parties to the agreement. Many water works officials assume that the receipts from the domestic use of water should pay the operation expenses and that the revenue from the rental of hydrants may be considered as profit. The reason for such an assumption is not evident.

In this paper an effort is made to determine the charge which may be called equitable and just. While it is known that such charge must vary with the conditions in different cities, it is hoped that despite the personal equation which must enter into any design and estimate, the results are close to the mean of the condition of the smaller inland cities of the middle West.

It was hoped to obtain from insurance companies data which would permit hydrant rental and fire protection to be balanced against increase of insurance rates for unprotected risks. It is well known that the fire insurance rates are very largely governed by the conditions attending the protection of buildings against fires. However, the mere fact that a town has a water plant and that hydrants are distributed over the built-up portions does not necessarily indicate that the insurance rates are lower than those in towns not so supplied. The rates established by insurance companies are generally arbitrary and what may be true in one town may be no basis for comparison in another. The insurance rate should depend upon the character and closeness of structure, the number and position of hydrants, availability of water plant in case of fire, reserve supply of water, number of firemen constantly on duty, and other conditions. Data relating to this phase of the subject were very difficult to obtain. Insurance men seem to have no accurate information concerning it. Besides so many elements enter into it that it is too complex for adequate treatment.

As has been said, no set rules fix hydrant rentals. A table is given below which has been compiled from data found in the thesis of R. P. Brower, University of Illinois, '97, and in the American Water Works Manual of 1897. The cities given are thought to be representative in population and conditions and similar to those used in the estimates made below.

8. McAULEY PLAN FOR LOGAN SQUARE, PHILADELPHIA.

TABLE I.

HYDRANT RENTAL RATES IN THE MIDDLE WEST.

CITY.	Population.	Hydrants per mile of Mains.	Hydrant Rental per Year.
Alpena, Mich	14,000	5.9	$62.00
Ann Arbor, Mich..	9,400	4.2	45.00
Circleville, O	6,500	10.0	35.00
Clinton, Ia	25,000	8.9	45.00
Conneaut,O	3,200	6.4	37.50
Council Bluffs, Ia...	21,500	7.0	75.00
Davenport, Ia	26,800	9.8	40.00
Eau Claire, Wis....	20,000	11.7	46.00
Fond Du Lac, Wis.	14,000	10.8	58.00
Frankfort, Ind	5,900	7.3	60.00
Franklin, Ind	3,800	8.2	50.00
Haughville, Ind	2,100	10.0	50.00
Independence, Mo .	6,400	5.8	80.00
Indianapolis, Ind ..105,000		7.8	50.00
Janesville, Wis	12,000	9.1	25.00
Ludington, Mich....	7,500	8.8	40.00
Marion, O	8,300	10.8	38.00
Mt. Jackson, Ind...	300	8.8	50.00
Muscatine, Ia	12,000	10.1	75.00
Noblesville, Ind	3,000	10.0	33.00
Oconto, Wis	5,200	15.4	65.00
Pontiac, Ill	2,800	12.0	42.00
Quincy, Ill	31,500	5.7	46.00
Rockport, Ind	2,300	7.1	40.00
Springfield, Mo.....	21,800	4.0	55.00
Springville, Ia	500	8.0	35.00
Streator, Ill	18,000	8.2	42.00
Superior,. Wis	26,000	15.00	40.00
Terre Haute, Ind...	30,200	13.9	40.00
Topeka, Kas	31,000	....	50.00
Warren, O	6,000	7.0	45.00
Xenia, O	7,300	7.7	37.50
Mean.....		8.9	$47.88

This corresponds very closely with $49.43 per year, the average hydrant rental throughout the United States, 544 cities and rentals ranging from $5 to $160, as given in the Manual of American Water Works for 1888.

The actual difference in cost between a combined fire protection and domestic service and a domestic system of water works, furnishes the only accurate foundation upon which to base the charge for hydrants. The purpose is to select towns representing average conditions and to design a system of water works for each to supply domestic demands only, and a system of water works providing fire protection as well. By obtaining the difference in cost in the two cases the proper charge for fire protection can be computed.

The cities selected as examples are Tolono, Paxton, Danville and Springfield, all situated in the central part of Illinois. These were chosen as representing average conditions in that portion of the country, as well as the average between the smallest size of town which may be expected to support a profitable private water plant and the largest city where plants are likely to be controlled by private companies. In very few instances is it a paying investment for private companies to install water works in a town of less than 1,000 people. On the other hand the large city can rarely afford to have its water supplied by a private company. The source of supply of the towns considered is also representative, as the majority of the prairie towns obtain water either from driven wells or near-by streams.

The principles upon which the two designs are based are similar. Maps of the town used were obtained and, knowing the local conditions as to business and residence districts, source of supply, and probable location of hydrants, a plan of the distribution system was made showing location of hydrants, valves and specials. The systems as laid out and planned are to be adequate for a period of twenty years. No dead ends were permitted. In order to obtain the population for which to provide, the census reports for the years 1890 and 1900 for the cities considered were investigated and from these the probable size of the city after twenty years was calculated. Where known the per capita domestic rate of consumption was used, and 225 per cent. of this employed to obtain the size of mains. Where provision was made for fire protection the governing element was the number and size of streams required to be concentrated at any one point. The same total length of pipe line was used in both systems, as well as an equal number of valves and specials. The source of supply was always the same, except that the number of driven wells varied in the two systems. In all cases it was desired to obtain the most economical installation and operation.

In the domestic systems 3-inch cast iron pipe is used for the minimum size, When possible, such an arrangement is made that pumping during the day only is necessary, an elevated reservoir supplying the night draught.

To determine the size of mains in the fire system, reference was made to authorities on the subject, to obtain the proper number of streams for cities of various populations. Four-inch pipe was used in some cases to connect dead ends of 6-inch pipe. Hydrants are not placed on sizes less than 6-inch.

That the results may be relatively the same a table of prices is used throughout the estimates. These prices were checked up with those prevailing at the present time and found to agree very closely. That part of the expense of laying pipe relating to excavations, back filling, handling of pipe and labor in making joints is obtained from Weston's tables for medium digging, compiled from work in Providence, R. I. An additional ten or fifteen per cent. is added to the total costs to cover engineering and contingencies.

The cost of operation in each system is found by estimating the fuel or power required, the supplies likely to be needed, the repairs necessary and the item of labor. These cannot be determined with certainty, but are probably as nearly correct in one case as another. The cost of fuel necessarily fluctuates with the water pumped and the varying prices of the kind used. Repairs can only be guessed at, as it is altogether impossible to foretell what break or alteration may occur or be needed. Here, as in the cost of the system, an additional per cent. is added to cover contingencies.

Under the heading "Sinking Fund" will be given the amount which, if placed annually at 5 per cent. compound interest, will provide an amount sufficient for the rebuilding of the pumping plant at the end of twenty years and of the distribution system in fifty years. Such a fund as this is not always set aside by officials, but there is no doubt but what in carefully operated plants it should be, to allow for future rebuilding.

The comparison will be based upon the sum of the three items given above, namely, first cost, operation and sinking fund. This sum will be reduced to a per hydrant rate and also with reference to the miles of mains and population.

The result of the foregoing designs and estimates are shown in tables III and IV.

Table III gives statistics relating to hydrants. The column headed "Hydrants per mile of main," gives a mean of about 7.4. This corresponds very nearly with that in existing mains.

Table IV presents the final results of the calculations. Column 6 shows the excess of first cost of fire protection system per hydrant over the cost of a domestic system. To obtain column 7, column 6 was considered as placed at 6 per cent. interest. Seven and one-half hydrants per mile and $50 per hydrant is nearly the same to the water company as 13 hydrants per mile and $30 per hydrant. This element of the design must be kept in mind in making comparisons of hydrant rentals in different cities.

Column 12 is the sum of 7, 9 and 11.

The results in the last three columns show some interesting relationships. In column 12 is found the final estimate of the reasonable hydrant charge under the conditions presented. It is to be expected that this charge must be high in cities the size of Tolono; the larger the city

TABLE III.

MAINS AND HYDRANTS.

City.	Population in 20 years.	Miles of Mains.	No. of Hydrants.	Hydrants per 1,000 of Population.	Hydrants per Mile of Main.
Tolono	1,000	2.74	21	21	7.7
Paxton	6,000	7.72	57	9.5	7.4
Danville	23,000	22.23	160	6.5	7.2
Springfield	35,000	33.77	255	7.3	7.3

TABLE IV.

ESTIMATED COSTS AND RESULTING HYDRANT RENTAL.

1	2	5	6	7	9	11	12	13	14
City.	Kind of System.	Total Cost.	Excess of Initial Cost per Hydrant.	Yearly interest, 6 %, One Hydrant.	Additional Yearly Cost.		Total Yearly Cost per Hydrant.	Yearly Cost.	
					Operation per Hyd.	Sinking Fund per Hyd.		Per Mile of Main.	Per 1,000 People.
Tolono	Domestic	$12,847.52	$615.21	$36.91	$9.64	$12.31	$58.86	$451.09	$1,236.06
	Fire and Domestic	25,766.89							
Paxton	Domestic	32,773.47	454.83	27.28	12.74	6.47	46.49	343.26	441.65
	Fire and Domestic	58,698.71							
Danville	Domestic	60,924.65	440.00	26.40	14.09	8.42	48.91	352.08	340.28
	Fire and Domestic	131,417.44							
Springfield	Domestic	231,231.99	508.38	35.90	7.12	7.21	50.23	319.87	379.30
	Fire and Domestic	383,818.59							

Columns 3, 4, 8 and 10 are omitted.

the less the cost of installation per hydrant.

With the same number of hydrants per mile the same relation will, of course, hold in column 13 as in column 12, and this similarity may be noted. As the number of hydrants per 1,000 people varied greatly, it is seen that the cost of hydrant rental per 1,000 population should vary also. By an inspection of column 14 it is seen that the cost drops rapidly from Tolono to Paxton, but not so rapidly beyond, and hence it may be assumed that for cities larger than Springfield the hydrant cost per 1,000 people would have an almost constant value. This is to be expected, because in larger cities population becomes more congested and fewer hydrants relatively will be needed.

The prices used in the estimate were checked up with those at present prevailing in the middle West. However, even if these varied considerably, the comparison would not be materially influenced, as the cost of the domestic system itself forms a very large part of the fire and domestic system.

A comparison of the mean hydrant rates found in tables I and II and those deduced in table IV shows another remarkable similarity.

HOW TO LAY A TILE FLOOR.

By J. E. Hyde, New York City.

No tile floor can be laid level or lasting over a poor foundation. It is the custom, in many buildings, to uee the leavings of the mason or other debris in the cellar, scatter some Rosendale cement over it, throw it into the space to be filled, then drown it with a hose and pound it in. As a consequence, there is no bond and the material will shift by vibrations. Sometimes the plasterers' scrapings are mixed in, and this will always cause trouble by swellings.

Good steam cinders with one-third sand mixed dry with natural hydraulic cement and just dampened and turned over several times and thoroughly rammed, will make a good foundation, care being exercised to see that all spaces are filled solid. It is customary for the mason to bring this level up to about two inches from the required finished levels. If there are any pipes to carry steam or hot water, cinders only should be used in a bed of about two inches on either side of them.

Tile Foundation—Presuming that the mason's foundation has set properly, and has not been disturbed, levels are established and a mixture of six parts sharp, clean sand to one of good Portland cement, well turned before wetting, then only dampened, and mixed thoroughly, is spread with a rake two inches thick, rolled or rammed down and scraped over with a straight edge, leaving this foundation one inch below the finished level.

This tile foundation should be laid twenty-four hours ahead of the tile setting and protected by boards for mechanics to walk upon.

Tile Setting—If the tile are semi-vitreous they should be soaked in clean water for two hours and then drained on edge on boards for half an hour before being set in floor and should be supplied to the tiler on boards about three feet long, piled up with the top sides up and the edges flush.

Provide sufficient straight edges of white pine three-quarters of an inch thick by four inches wide, planed true on all sides, also several beating-in blocks of apple, cherry or some close-grained wood eight inches long, four wide by two thick, one side smooth. Lay a straight edge against the base board or line of same and another parallel to it about three feet distant, but the actual width of tile border and an exact number of tiles. Lay these straight edges in lime-cement mortar, the top surfaces being the levels of the finished tile floor. Behind the outside straight edge drive some long nails into the foundation to keep it in place. Take a straight piece of board six inches longer than the space between the straight edges and make a screed by cutting back on one edge about four inches from the ends and to a depth of two-thirds the thickness of the tile, so that, when the cement is spread with the flat trowel, it can be screeded off with the board, the ends working on the straight edges previously set.

Mix thoroughly three parts sharp, clean sand to one of Portland cement dry, then wet sufficiently to allow of stiff flow under flat trowel, fill in space, screed, sprinkle a little dry cement and place in the tile, scatter a little fine, white sand over the tile (we use screened sea sand in this district for this purpose) and beat in gently with wood beater by hand till tile are all placed, then use hammer on block till driven home. When home use the block like a scrubbing brush with a rotary movement till tile are all true. If water comes up over the tile the mixture was too wet. Take up a few tile and sprinkle some dry cement.

It is better to start tiling in a square corner away from supply. If the corner is not square the border may be cut a little, but architects prefer to show full width of border, in which case lay from longest straight side of room so as to have cutting on one side. Do not hammer in the tile till all the cement surface is covered with tile.

Remove straight edges, relay five feet from last finished edge after cutting cement close up to the laid tile, make new screed for this width and proceed as before, laying plank on tiled portion and working from both sides. Do not leave straight edges down over night, but clean off thoroughly and lay flat. Be sure to cut cement up close to tile. After laying first section of tile, the laid tile is used as the inside straight edge.

The next day sweep the tiled floor clean, mix up pure cement and water to a thick cream and spread in this grout with the edge of a short board. After two hours' set, rub clean with sawdust or excelsior and, when finished, cover with clean sawdust, if other mechanics are going on the work. One part commercial muriatic acid to ten parts of water mixed in wooden pail and applied with broom will remove Portland cement stains.

Tiles up to three inches can be laid close joint but above that should be laid with open joint. All nickel work should be thoroughly protected with a mixture of vaseline and whiting and further protected near the floor by rags wrapped and tied. Do not remove vaseline mixture till after the acid has been used.

Care should be taken in obtaining levels from someone responsible and where borders are to meet base boards not yet placed, obtain the lines from the marble man or carpenter or you may be obliged to relay your borders.

JAIL CORRIDOR. CONCRETE-STEEL FLOOR, WALL AND CEILING.

EDITORIAL COMMENT

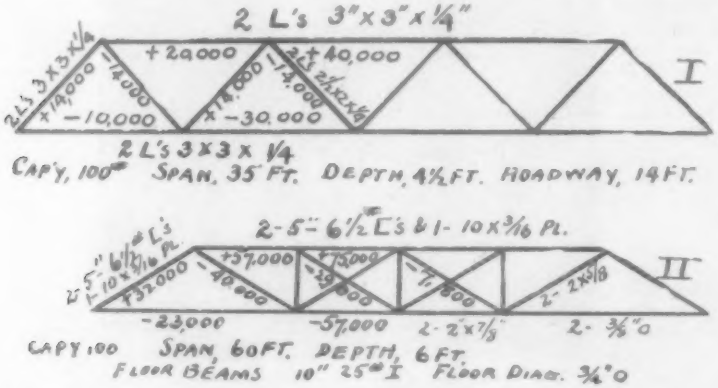
Some Curiosities of Bridge Lettings.

The Determination of an Equitable Hydrant Rental.

How Shall the City Engineer be Appointed.

SOME CURIOSITIES OF BRIDGE LETTINGS.

A correspondent from Oklahoma sends in sketches of bridges recently let by contract stating that the blue prints contained the information given in the diagrams shown herewith. The contract weight of bridge I was 5,000 pounds and price $137.50. The only additional data furnished were that needle beams were 31½ pound I's, floor diagonals, four ⅞-inch rods, side braces each 2 angles 2 by 2 by ⅜ inch. The contract weight of bridge II was 18,333 pounds and price f. o. b., $286.33. No further data are given for this bridge, except that the first piece in the top chord is marked as 8¼ feet long.



Apparently bridge I is computed as though the entire weight was at the center of the bridge, so far as chord stresses and first diagonals are concerned. The stresses in bridge II as given cannot be obtained on supposition that the truss is an ordinary Pratt truss. If the first panel dimension given above is correct, the stresses can hardly be computed without knowledge of the dimensions of the other panels.

How near do the members as described come to the proper weight for the stresses named? How near is the "contract weight" to the actual weight which the bridge has or should have? In what other section of the country can a bridge be purchased f. o. b. at the price of bridge II? How much more will it cost to get the bridges in position, including furnishing of flooring if that is not included in the contract? These are a few more of the puzzles that suggest themselves.

A correspondent from a state farther east sends the plans and specifications for a concrete arch which answer exactly to the description of the Melan arch given in our question department this month. Neither plan nor specifications, however, contains any reference to the fact that Professor Melan holds a patent on this form of arch and that users are required to pay a royalty to his representatives in this country. The only provision is in the instructions to bidders, which contain the usual general clause requiring the successful bidder to furnish bond "for the faithful performance of the contract and to protect and indemnify the corporation against any loss or damage it may sustain on account of any infringement of any patent by reason of the materials, machinery, device or apparatus used in the performance of said contract." The facts that the highest bids were 50 per cent. above the lowest, that some bidders required the usual royalty in addition to their bids for construction for insuring against infringements and that bids were all rejected, are evidence that no one was victimized. Bids are now asked for a steel bridge, each bidder to furnish his own plans. A peculiar error in these specifications is in the provision that the "broken stone for concrete shall be of the best quality of hard burned limestone, trap rock or granite."

The Oklahoma case is evidently a case of the blind leading the blind, and the only immediate remedy for such a condition is the compulsory revision of plans for public bridges by a competent county or state authority, before bids can be asked. Mr. Wolfer's paper before the last meeting of the Indiana Engineering Society suggested one method of meeting the difficulty. A short abstract of this paper will be found on another page. The other case certainly should not be placed in the same class, but it indicates on the face of it either an ignorance of popular engineering construction which is inexcusable in one capable of preparing the class of plans submitted for bids in this case, or an attempt to place the responsibility for the payment of royalty on the contractor. This was done, whether intentionally or not does not appear, in such a manner as to make it possible to save to the corporation the royalty on the patent at the expense of a contractor, if one ignorant of its legal status should happen to bid.

The state inspector of bridge plans, suggested by Mr. Wolfer, might be able to correct such an error as this, and the institution of his department would certainly cure the evils of the method of calling for bids, contractors to furnish their own plans.

THE DETERMINATION OF AN EQUITABLE HYDRANT RENTAL.

The article by Mr. D. H. Sawyer to be found elsewhere in this number of Municipal Engineering gives an illustration of a method of determining hydrant rental in cities whose water supplies are furnished by private companies, which has been proposed frequently by this magazine in years past. The article is from a thesis prepared by Mr. Sawyer for his graduation at the University of Illinois and is an interesting and instructive study of the subject.

A water company proposes to construct a plant in a small city or town for the commercial advantages to be gained. It is assumed that the company does not require any bonus in the shape of a favorable contract for city service or any other, since, considering all the private water plants in operation, this is a very exceptional condition. Water, like any other commodity which can be measured, should be paid for in proportion to the amount used and the cost of supplying it. This is the fundamental principle, whether meter or flat rates are charged, and the flat rates are prepared with some idea that, beyond a minimum for family use, the receipts will bear some rough proportion to the consumption of water, the injustice of flat rates arising when waste or wilful misuse of water by some customers increases the rates of careful users. So far as the ordinary city uses of water are concerned, city buildings, sewer flushing, street sprinkling, fountains and the like, the same principle applies and rates should be fixed in accordance therewith.

One of the principal advantages of a water supply to a city, however, is the fire protection which it makes possible. This cannot be measured by the amount of water used, which is so small as to be seldom worth considering. The ability to use this water at the time and place it is needed is what makes the service valuable, and a dollar's worth of water at meter rates may save from destruction property worth more than the cost of the entire water system.

Mr. Sawyer tried to find a measure of this advantage in the difference in insurance rates and failed. The reason is not far to seek and is to be found in the lack of scientific study of the problem of insurance risks, and the demands of competition. There are many other considerations than the presence or absence of a water pipe system which seem to affect rates more than this factor, the efficiency of the fire department, for example. A town in Ohio is cited as one of the evidences of the haphazard manner in which insurance rates are sometimes determined. This town put in a system of water works, one of the principal arguments with the council being that insurance rates throughout the corporation would be reduced. When the works were completed and the fire department was properly supplied with hose and carts, application was made through the proper channels for the expected reduction. When the underwriters' board came to consider the case they raised the rates, instead of lowering them, as it was found that they were already much lower than those in similar places and the companies were losing money in the state as a whole. If attention had not been called to the matter the low rates might have continued indefinitely with or without water works. A few insurance companies have made thorough studies of their business and do not take chances outside the law of averages which they have determined. Their risks would probably not be found in a town with such rates as this. But other new companies or those needing new business run rates up or down with no reference to any facts except that they need the premiums and as much of them as they can get.

Present hydrant rentals have apparently been fixed by comparison with other towns and range from $5 to $160, most of them being between $25 and $75. Mr. Sawyer's average of 32 cities in the central states is $47.88 and the average of

the United States is $49.53 as stated by him. These averages are taken without reference to the numbers of hydrants in the cities.

The method of computing the equitable hydrant rental, which is used by Mr. Sawyer, takes into account simply the increase in cost of the water supply system on account of the increase in capacity necessary to supply what experience has shown to be efficient fire service. From the standpoint of the water company this is the minimum rental which should be paid. A less rental theoretically means that the city is credited with the difference in payment for the franchise, a greater rental that the city is paying a bonus to the company. The details of Mr. Sawyer's computations are omitted as being applicable only to the particular cities considered, but enough is given to show the principle upon which they are based and the method of application in practice, including the effect of "intermediate" hydrants for which cities pay a specially low rate based on the actual cost of putting in the hydrant and its connection alone.

It is interesting to note that the mean of Mr. Sawyer's results for the four representative cities of various populations, $51.12, is so near that of the country at large. If his average can be extended to cover the whole number of cities, it shows that, whatever the seeming eccentricity of variation in rates, the general experience has settled upon an average price which will pay the cost of the service. The true method of determining the average hydrant rental now paid would take account of the number of hydrants in use in each city, forming a "weighted mean" rather than an average of the contract rates for the various cities.

When the rate for efficient fire service has been determined, by the method outlined by Mr. Sawyer, the intermediate hydrants in special districts may be added at a low rate based on the small cost of putting them in. It would not be fair to the company, ordinarily, to make an average rate based on the total charge for hydrants and the number, since the intermediate hydrants would pull down the average price and extensions would require hydrants which should be paid for at the rental computed without the intermediates.

The contracts of many cities for hydrant rental are expiring and the determination of the rate for the new contract can be made quite readily by comparing the actual cost of the present water system with the estimated cost of a system covering the same area for domestic service only. Some allowance should probably be made for increase in the system if it is considered that this might vary the hydrant rental. The columns in Mr. Sawyer's tables showing the variations in cost per mile of main and per thousand of population show the reason for considering this factor.

HOW SHALL THE CITY ENGINEER BE APPOINTED?

In a paper before the Iowa Engineering Society the methods of choosing city engineers in various cities are given, with comments by the engineers. A part of the paper will be found on another page, containing some suggestions on the subject.

The differences in method of appointment are arbitrary and few, if any, of the cities named in the paper have any definite principle upon which the method of appointment is based. This should be the first consideration. In the smaller cities the engineer is simply the clerk of the city council and its executive officer so far as his class of duties is concerned. His duties are those of a technical clerk, to carry out the orders of the council. He should be a competent civil engineer, and his appointment should be removed from politics and his term of office during good behavior. The recommendation of many of the engineers in the paper mentioned that the office should be under civil service regulations, municipal or state, is based on a proper recognition of these principles. Being the servant of the council for non-political uses, his political affiliations are of no account. If he is disobedient to his orders the council should have the power of removal, but this should be restricted in some way by requiring proof of charges, for council's orders are sometimes impossible of fulfillment by an engineer who wishes to do his duty by the city.

In some of the larger cities the city engineer occupies a similar position, while in others he is the head of an executive department, whose policy must be that of the administration. Evidently, in such a case his appointment should be in the hands of the responsible head of the administration, governed only by such restrictions as may be deemed necessary to insure technical qualifications. Sympathy with the plans for improvement by the administration, rather than affiliation with any political party, is the standard for choice from qualified candidates.

The election of city engineer by the people, and his appointment by the council, both bring up the question of the location of responsibility. So long as the town is small enough to be governed by the town meeting or is so close to its town council as to have equivalent control over the course of events, the responsibility for the administration is well

placed in the hands of the council as representatives of the people. When the city grows larger and the administration is farther removed from the individual citizens, it is necessary, just as it is in any other business corporation, to centralize the responsibility for the administration of city affairs. This means the separation of the legislative functions of the council from the administrative functions of the mayor and his boards and the centralization of responsibility upon one manager, who takes his instructions, first from the people in the campaign preceding election, and second to some extent from the council as the representatives of the people in carrying out those instructions. See page 26 of the January number for further discussion of this principle. This puts the appointment of the city engineer logically in the hands of the mayor, subject to technical qualifications as suggested. In the article referred to, the evils of the division of responsibility by the election of more than one administrative officer by the people are considered, that of city engineer being included.

The paper gives the reports of the present conditions and some suggestions of methods which may be applied under the present lack of system. None of them will be satisfactory in all cases, nor will others until the principles of business administration of the greatest business trust there is in the community are definitely recognized and the government of the city is reorganized on lines to conform therewith.

THE QUESTION DEPARTMENT

HOW TO CONSTRUCT CONCRETE FOUNDATIONS.

Please give in your magazine the detailed method of constructing concrete foundation walls. I mean by this manner of building crib or form, number of men required to do the work profitably.

JAS. REA GORDON,
Waynesburg, Pa.

For the portion of the foundation in excavation forms may not be necessary, the concrete being rammed into the excavation as made. If sheeting of trench is necessary the sheeting boards may be left in or under some conditions may be drawn as the concrete is deposited. The forms in which the concrete is to be deposited above the ground surface must be strong enough to keep their form under the ramming. In the "Directory of American Cement Industries and Hand-Book for Cement Users" ($5) will be found further directions. For example, the Illinois Central Railroad specifications require in general 2-inch planks for the facing of all molds and studding for frames of braces, placed at intervals of not more than 4 feet. On page 88 of the last (February) number of Municipal Engineering will be found a description of a method of carrying walls up after the first layer so that long bracing will not be necessary. This method is illustrated on page 101. The proportions of various materials ordinarily used are stated in detail in the "Hand-Book for Cement Users" referred to above.

The number of men which can be worked profitably depends largely upon the conditions at the particular foundation. On the concrete lining for the Forest Hill reservoir, estimate of the cost of laying which is given in the "Hand-Book for Cement Users," a concreting gang was made up of 1 sub-foreman, 2 men gauging materials, 2 men mixing mortar, 3 men turning concrete, 3 men wheeling concrete, 1 man placing and 2 men ramming, all mixing and placing being by hand, and all concrete being turned three times. The average of the two gangs per day was 20 yards or 1.43 cubic yards per man per day, costing slightly more than $1 a cubic yard for the work indicated. Probably work on confined building foundations could not be done quite so advantageously, but these figures will serve as a basis from which to determine the actual labor required for a particular case.

THE MELAN ARCH PATENT.

I would consider it a favor if you would explain to me what constitutes the patent of the Melan arch. SUBSCRIBER.

—, Ill.

The Melan arch patent in the United States is No. 505,054 and was issued September 12, 1893, to Joseph Melan of Aus-

tria-Hungary. The claims made are as follows:

1. A vault or arch consisting of abutments, beams or girders, arched ribs rigidly connected with said abutments, beams or girders, and a filling of concrete or the like between said ribs.

2. A vault or arch consisting of abutments, beams or girders, arched ribs having beveled ends located between and resting at their ends upon said abutments, beams or girders, and a filling of concrete or the like between the said ribs.

3. A vault or arch, consisting of abutments, beams or girders, arched ribs having beveled ends located between and resting at their ends upon said abutments, beams or girders, wedge plates between the ends of said ribs and said beams or girders, and a filling of concrete or the like between said ribs.

The drawings show the system applied to floor arches between beams or girders. The descriptions state that T or I beams may be used for short spans or riveted iron or steel plates for long or short spans, with the purpose of making the arched ribs stiff transversely.

The application of the system in this country has been mainly to the construction of arch bridges of longer span than floor systems would require and the bearing surfaces in such construction are the abutments of the patent claims, the rigid connection being obtained by bearing plates or beams or embedding in the concrete of the abutment.

CORROSION OF STEEL IN CONCRETE.

Will steel or iron rust in steel-concrete construction when the concrete is constantly saturated with water as would be the case in a sewer or reservoir? Will milk of lime placed in the cement-concrete in the proportion of say one part of cement and one part of lime corrode the steel in steel-concrete construction? Will lime mixed in the proper manner with cement eventually weaken the concrete by the caustic action of the lime? Would it not improve steel-concrete construction to use a small amount of the milk of lime to make the concrete impervious to water? E. B. S.,
Owensboro, Ky.

These are all questions which are at present the subject of careful experiments. Thus far the results indicate that steel is completely protected from corrosion by a covering of cement such as it receives when properly surrounded with concrete and that when completely covered with the thin wash of cement which adheres to it the immersion of the mass in water has no deleterious effect on the steel. What effect impure water, electric action or other peculiarities would have is not known. Lime is not so thorough a protector of steel from corrosion and if lime is used in the concrete care should be taken to use close to the steel members concrete mixed without the lime. This is suggested as a precaution, experiment not yet having demonstrated the effect of the lime mixture in the protection of the steel. A small amount of lime causes cement mortar to work more easily and renders it possible to use more sand, when a large proportion of sand is desired in the mortar. It makes the mortar more dense and thus more nearly water-proof. The lime weakens the mortar and renders it more susceptible to the action of the weather if in too great quantity. What the effects of various proportions of lime will be must yet be determined by experiment.

BRICKS OF CEMENT AND SAND.

Will you inform me where machines can be purchased for making cement brick? J., ——, S. Dak.

Reference may be made to the "Business Directory" in our advertising columns under the heading "Cement Construction," for the names of makers of cement block machines. Some of these can be modified to make cement bricks and one or two of them have special molds or machines which can be used for making bricks. Further information on the subject will be found in Municipal Engineering, vol. xxii, p. 92, and vol. xxi, p. 404.

MACHINES AND METHODS FOR MAKING HOLLOW BUILDING BLOCKS.

I wish to know the points about the machines for making hollow building blocks; also as to the dry and the wet systems of making artificial stone. How high a building is it advisable to make with 8, 12 and 18 inch blocks?
GEORGE W. CLARK.
Everett, Wash.

The machines for making hollow building blocks all use the dry system of mixing the materials. The cement and sand, gravel or stone are first thoroughly mixed dry and are then sprinkled with water in a final turning over, the amount of water used being the smallest quantity which will supply the needs of the cement in setting. The mixture is thus scarcely damp and, when well rammed into the molds, forms a block which retains its form when the sides, ends and cores of the mold are removed, and it can be set aside to harden on a removable base plate which formed a part of the mold or on a plank or other plane surface to which it is transferred before the sides of the mold are removed.

The machines on the market vary in form and in method of operation, and the best idea of them can be obtained from a study of the catalogues of the makers or better yet, an inspection of their operation. The advertisements of all the suc-

cessful machines with which the writer is acquainted will be found in the advertising pages of Municipal Engineering and the names and addresses of the manufacturers and agents will be found in the "Business Directory" under the heading "Cement Construction."

The Harmon S. Palmer machine is the pioneer in the patent office and is advertised by W. W. Benson of 803 Drexel building, Philadelphia, Pa., and the Harmon S. Palmer Hollow Concrete Building Block Co. of Washington, D C. In this machine the sides and ends open on hinges, the cores are lowered and the block is lifted out on a removable base plate. The plates forming the sides and ends can be changed to give any desired pattern of face and certain variations in form and size of block. Machines of different sizes make blocks from 8 to 18 inches thick and 32 inches long, chimney blocks, lintels and sills 54 inches long, with variations in face, form and size up to the largest of which each machine is capable. Special forms for corners, window casings and for insertion of joists are also made.

The Noyes F. Palmer machine of 150 Snediker-ave., Brooklyn, N. Y., is so designed that the sides and ends of the machine are moved horizontally from the finished block, the cores are moved downward and the block is raised to the top of the machine and carried away on the platen which formed the bottom of the mold. The distances apart of sides and ends and the cores are adjustable, and sides and ends of various sizes and faces can be used so that a large number of sizes and forms of whole and fractional blocks can be made on one machine. Widths vary from 6 to 18 inches, lengths from 26 to 36 inches, cores from 2 to 5 inches.

The Normandin Cement-Concrete Construction block machine, of the Cement Machinery Company, Jackson, Mich., was patented January 13, 1903, and a full description of the machine is not at hand. The photograph of the machine indicates that the cores are raised or lowered by a single operation of a lever, and that one operation closes and locks all the sides of the molds, or unlocks and opens them. Cores, ends, sides and designs for faces are all adjustable. The fork for lifting blocks can be operated by hand or by crane. Eight machines are included in the one by means of the simple changes and adjustments.

The Seamans block machine of E. W. Seamans, Grand Rapids, Mich., is quite fully described in the department of Machinery and Trade in this number of Municipal Engineering, to which reference should be made. The block is smaller than the others described, the smallest size being 8 by 8 by 16 inches with two hollows each 4 by 5 inches. Two blocks are made at one operation. The blocks are removed from the machine on a board or other plane surface by turning the machine over upon it, pulling up the cores and removing the base, sides and ends and at the same time setting them for a new pair of blocks.

Litholite, manufactured by the Stevens Cast Stone Company, 808, 100 Washington-st., Chicago, Ill., and Granilite, made by the Standard Stone Company, Wilmington, Del., are made by a wet process and no machinery is required. Molds, ordinarily of sand, are made with the original objects or their duplicates as patterns, and the mixture of cement and fine stone which is used is made wet enough to fill the molds without pressure or hard ramming. The materials and methods used are covered by certain patents and can be varied to produce any desired color and texture of surface. The makers also lay special emphasis upon the quality of the block made by their process. The surfaces have certainly as fine an appearance as could possibly be wished and the quality of the material and method of manufacture are such that the results are perfectly uniform and the stones should be more durable than any natural building stone, not excepting granite, if the resistance to heat is taken into consideration. It is evident that there is no restriction of any kind upon the form, size (within reasonable limits) or face of these blocks.

No attempt is here made to compare the various machines or their products. Each of the machines mentioned has its advantages and the value of each for the particular duty required should be investigated by the prospective purchaser. There should be no difference in quality of product, either in material or in appearance, these depending upon the materials used and method of mixing and placing them rather than on the machine. The writer is not sufficiently acquainted with all the machines to make a comparison with reference to speed of operation and economy of labor.

The two processes also have their respective advantages and require similar investigation with reference to their applicability to the conditions to be met. It seems to the writer to be probable that the two processes could be operated to advantage by the same stone manufacturing company.

Tests of the Palmer blocks show that the 10-inch blocks are more than equal in strength to the 13-inch brick walls which they are intended to displace. The thickness of walls for various hights and weights to be carried may therefore be safely computed with this as a basis. The

walls would probably develop greater strength when built of the blocks, whatever their size, than when built of the equivalent thickness of brick, on account of the better bearing and smaller number of joints. When heavy weights are to be carried the blocks can be made solid, with much increase in the compressive strength of the single blocks. For walls of great hight increase in thickness of wall is of as much importance as increase in bearing strength. The recent investigations into the relative strength of wet and dry concrete seem to indicate that the blocks made by the wet process are even stronger than those made by the dry process, so that the same methods of computation can be applied to both.

METHOD OF KEEPING WATER-WORKS RECORDS.

Our water works have been constructed since 1894 and the number of water takers has increased from 150 the first year to 750 at the present date, and will probably increase 50 to 100 more in the next two years. As the system is under control of council, the expenditures are authorized by them and kept by the treasurer. We have no meters and do not allow delinquents, so that we have no need of a full set of books. I may add that we employ a collector, who goes from house to house quarterly, collects the rates as well for water as for building, flushing sewers, etc., and pays the same over to the treasurer, who enters all to the credit of the water works. The collector is also superintendent. The collections in this way are more troublesome, but we find it pays us, as we have not had a single dollar of arrears in eight years. I am giving you these particulars that you may be able to give us pointers to enable us to improve our system of water works accounts.

A. J. FORTIER, Town Clerk,
Pembroke, Ont.

A small plant does not require as large and elaborate a system of books as a large plant, but the principle upon which it should be based is the same. As a result of a competition instituted by this magazine for a prize to the best set of water works forms of account and blanks, a system of books and records was devised which is specially well adapted to works of small and medium size, and which can easily be expanded to fit almost any circumstances. For the present case the following parts of the system are the most desirable:

The rated water register will keep the accounts of customers three years without transfer and can be so used as to extend the time before transfer any multiple of three years. All regular users can be recorded in this book. A small special register for such special uses as building property, flushing sewers, etc., will be a convenience.

The cash received register is intended for a distribution of all cash items to the various accounts of rated water, metered water, meter rent, special, sundries and the same from delinquent accounts. A book with double ruling giving opportunity for separation of the items from the rated water register and the special register into separate columns may be all that is needed in this case, though a column for sundry receipts will also be found very convenient.

The most convenient method of keeping the records of the services of the various water consumers is the card system. The American Water Works Standard Bookkeeping System, to which the above books belong, has a set of cards, one showing the application for service, signed by the consumer and filed under street and number, and another giving the plumber's permit to be returned by him when the work is completed, inspected and approved and water turned on, and showing also the location and kind of all fixtures put in, this to be filed under the applicant's (consumer's) name. Another pair of cards gives the same information regarding changes in services, which are filed in the same way, so that all the information regarding a house can be found by referring to the cards filed under the street and number or to those filed under the user's name.

The personal collection of bills in the manner described is an excellent custom which might well be followed by many of the smaller works which have one or more competent employes not too fully occupied to permit detailing them upon this work.

The criticism usually made upon the expenditure of money by another city department without regard to the management of the water department is that the division of responsibility makes the operation of the works more expensive than it should be and the balancing of accounts too difficult, if greater abuses do not creep in. The record of cash disbursements and vouchers, which is one of the books in the American Water Works Standard Bookkeeping System, should be kept by the superintendent of the works, so that all the records of receipts and expenditures shall be in the same office and kept by one who is able to make the proper distribution of accounts, and who is specially interested in the relations of income to outgo. This should not displace the accounts kept by the treasurer, but should be in addition thereto, and the two officers should frequently compare their accounts that they may be kept closely in accord. To permit the keeping of the account of expenditures by the water works superintendent all vouchers and payments should be made only under his counter-signature and his record should be made up from

such vouchers, checked by reports at regular intervals made to him by the treasurer of the vouchers actually paid in that office. He should have some influence upon the question of expenditures and have authority to withhold his signature and prevent the payment of a bill if it is irregular or funds of the department will not warrant the expenditure. Under a properly centralized management no appropriation should be made by the council without his recommendation and no bill should be paid unless reported by him as proper and regular.

Municipal Engineering Company can supply the books and cards described in sizes and bindings as they may be desired.

PRODUCTION AND IMPORTATION OF CEMENT IN 1902.

I am desirous of obtaining figures regarding the production of Portland cement in the United States for 1902, with comparative figures regarding imports.

W. V., New York City.

Reference should be made to the article on "The Cement Industry and Its Prospects for 1903," on page 83 of the February number, for an estimate of the production of Portland cement in 1902. It is there stated to be 14,400,000 barrels of 380 pounds net, and the basis of the estimate is given. An independent line of investigation by persons interested in the trade, including many letters to cement agents throughout the country, led to an estimate which quite accurately verifies the above stated estimate.

The importation for the year has been more than twice that of the year before, and is practically the same as the average for the past five years. In barrels of 380 pounds, net, the importation in 1901 was 994,623 barrels, and in 1902 is was 2,099,779 barrels. The re-export of foreign cement was 45,885 barrels in 1901 and 34,309 barrels in 1902, while the export of domestic cement in 1901 was 373,934 barrels and 340,821 barrels in 1902. This makes the net consumption in this country on the above account 574,804 barrels in 1901 and 1,724,649 in 1902, and the total consumption for 1902 is 16,124,649, as compared with 13,286,029 barrels in 1901. This is assumed to be all Portland cement, although a comparatively small amount of the importation and exportation is undoubtedly natural hydraulic cement.

COST OF SHEETING SEWER TRENCHES.

I would like to know the cost of excavating and sheeting sewer trenches in sand and gravel.

N. B. RIDGE,
Sterling, Ill.

The data on the cost of this kind of work are not very full and are not always in accord on account of the great differences in conditions.

In some work in Peoria, Ill., the engineer for the contractors kept close account and found that in trenches from 8 to 16 feet deep in sand with 2x8 sheeting and 6x6 braces of hemlock, the sheeting cost in place and pulled after use, ready to use again, from 10 to 25 cents per lineal foot of trench. The excavating and back filling, including contractors' profit, cost from 21 cents per lineal foot for trench less than 8 feet deep to 76 cents for trench 14 to 16 feet deep.

In Municipal Engineering, vol. xxi, p. 409, will be found details of cost of sewer construction in Iowa. It is there stated that placing the sheeting for sewer trenches less than 10 feet deep will cost from 5 to 12½ cents per lineal foot of trench and from 25 to 75 cents in trenches between 10 and 20 feet deep, with some increase for increased width of trench for larger sewers. A trench 25 feet deep and 16 feet wide costs about $2.75 per foot for driving and removing. The same article gives a diagram for determining the cost of trenching and back-filling for sewers of various pipe from 8 inches to 36 inches in diameter and depths from 5 to 26 feet.

A SCHEDULE OF WATER RATES.

Can you give me a schedule of the flat and meter rates charged for water in your city?

H. J. GONDEN, City Editor,
Omaha Bee.

The meter rates of the Indianapolis Water company range from 18 cents per 1,000 gallons for a monthly consumption of 7,500 gallons to 4.5 cents for a monthly consumption of 1,875,000 gallons. The minimum annual earning of the smallest meter must be $16.20, which practically prevents their use on domestic services. The water company furnishes the meters and keeps them in repair. Consumers must keep meters from freezing and the surroundings must be clear and clean.

As applied to a private house the following flat rates per annum are charged.

General charge for water to a dwelling house:

For house of 1 or 2 rooms	$3 00
For house of 3 rooms	4 00
For house of 4 to 6 rooms	5 00
For each additional room	1 00
For each additional family	3 00

Laundry tubs and wash-stands are not charged for in connection with family use, except that where there is a wash-stand in a bathroom the charge will be the same as though the water was connected with the bathtub proper.

Hose use per season for lot 20 feet or less in width, $4.00.

For each additional foot-width, 10 cents, if in connection with family use on streets not sprinkled by public contract.

On streets so sprinkled, $3.40 and 5 cents respectively.

One bathtub	$3 00
Each additional tub	2 00
One water closet	3 00
Each additional one	2 00

unless it is the only connection, in which case the family rate will be charged.

This makes a house of eight rooms on a 20-foot lot, with bath, two water closets and hose use cost $7 for family use; $3 for bath, $5 for water closets and $4 for sprinkler, or $19 a year.

There is a long list of special uses which has developed from years of experience. It includes air pumps, bakeries, banks, barber shops, blacksmith shops, boarding houses, bottling beer, building rates, brick, stone, plaster, concrete, curbing, etc.; candy factories, churches, organ motors, dental offices, dyeing, fire protection lines, fish and oyster houses, fountains, gas engines, green houses, heat regulators, hot water heating, hydraulic elevator, livery stables, delivery wagons, express, hack and omnibus, manufacturers, motors, offices, photograph galleries, poultry houses, printing offices, restaurants, saloons, sewer trenches, soda fountains, stables, steam boilers for heating, steam engines, stores, street sprinklers, tumbler washers, urinals, vegetable sprays, water lifters, water motors, window displays.

DOWN-DRAFT SMOKELESS FURNACES.

The city of St. Louis has enacted an ordinance prohibiting the discharge of dense smoke into the atmosphere. I am interested in a plant wherein such a smoke-consuming device is required. The down-draft principle has been recommended. Can you give me any information in reference to devices of this character and the principle of the same? Are you aware of any recent improvements thereon, and from whom they can be obtained? Are apy of the devices covered by patents or can the same be manufactured by any competent and reputable boiler mechanic?

T. H. B., St. Louis, Mo.

The principle of the down-draft furnace is more satisfactory than that of any other smokeless furnace and if well designed and operated the practical results are all that could be desired in the way of smoke consuming. In short, the air which feeds the fire is drawn in from above and thus the products of the distillation of the cool coal with which the fire is fed are drawn directly through the hottest part of the furnace and consumed. In the ordinary furnace these distillation products pass off at too low a temperature and without oxygen enough to cause their combustion, though the carbon in the draft may become incandescent, and when they reach the stack are cooled and pass into the air in a finely divided state producing smoke. In the down-draft furnace these products are heated in passing through the fire to such a degree that they are consumed and add their proportion to the heat of the furnace rather than passing off to produce a nuisance.

As the main grate is in the hottest part of the flame it must be protected, and in the Hawley furnace of Chicago this is done by making the grate of tubes through which water is continually forced. There may be other methods of protecting the grate bars, but this method is effective. A good draft is evidently required and the furnace cannot be properly worked beyond a certain rate. Good water is an essential for the circulation through the grate bars, as impure water will deposit its impurities in the bars and their connections and cause them to burn out. Improvements in the furnace may be made to suit certain conditions, and these improvements, as well as the original design of the furnace, are proper subjects for patents, and are probably well covered with them.

If there are other successful down-draft furnaces and any recent improvements, as well as any unpatented devices in use, we shall take pleasure in printing reports of their operation if our readers will send them for that purpose.

PRESERVATION OF TIMBER.

Do you know of any work of moderate cost which gives information on the subject of creosoting timber, in a plain, practical manner, with information that will enable me to make specifications for the treating of timber for preservation from teredo? W. H., Pensacola, Fla.

Two small English books on the subject of the preservation of timber are Boulton's "Preservation of Timber by Use of Antiseptics" (50 cents), and Britton's "Dry Rot" ($3), giving also remarks on means of preserving wood from beetles, ants, etc. Charpentier's treatise on "Timber" ($6 net) has been translated into English. It has a chapter on the preservation of timber. Wood's "Treatise on the Resistance of Materials" ($2) has an appendix on the preservation of timber. Rowe's "Hand Book of Timber Preservation" is devoted to the Burnett and Wellhouse processes, but has some information on creosoting also. The creosoting companies can furnish much valuable information. Reference may be made to the "Business Directory" on another page, under the heading of "Creosoted Wood Blocks." Several southern railroads have full specifications for preserving timber of which copies may possibly be obtained on application to their chief engineers. Chapters on methods of preserving timber will be found in Thurston's "Materials of Engineering" Part 1 ($2) and his "Text Book of the Materials of Construction" ($5) and in other volumes on the same subjects. There are also some government reports on various methods used in both the army and navy.

MOST PROFITABLE BRANCH OF CIVIL ENGINEERING — EXPANDED METAL — MACADAM ROAD CONSTRUCTION—EFFICIENCY OF TURBINE WHEELS.

1. What branch of civil engineering is most profitable from a pecuniary point of view, assuming that the same amount of energy and study is devoted to each branch?
2. What is meant by expanded metal and where can I obtain detailed information as to its uses, etc.?
3. What use can be made of tailings from the screen of a stone crusher in macadam road construction?
4. Is it customary to use screenings on the bottom or first course of a macadam road?
5. In a well constructed macadam road what is the per cent. of voids in the upper and lower layers of stone?
6. What is the greatest efficiency that has been attained by any make of turbine? SUBSCRIBER, Wilson, N. C.

1. This question can not be answered generally, for the variations in amount and importance of different classes of work at different times and in different localities makes an answer for one time or place entirely inapplicable for another time or place. The relative position of the engineer in his profession is also an important factor. It may be assumed, with some reservations, that the compensation of engineers at head of their respective branches is somewhere near equal, and that the question refers to the rank and file of the profession.

As examples of the changes which may occur the following may be mentioned: Railroad engineering was at one time the most promising field for young engineers but construction work now calls for comparatively few new men and the maintenance and operating departments are now more promising fields, though somewhat restricted in extent. Just at present the construction, maintenance and operation of electric roads is using an increasing number of engineers. In the older sections of the country and in a few scattered localities municipal engineering is a promising field, rather for what is in the future than in the present. The improvements in methods of transmitting electricity and the larger stock of information regarding water supplies are causing an increase in the developments of water powers, and will doubtless furnish occupation for competent engineers. Various lines under these general heads might be followed out, such as sewage disposal, irrigation, bridge work, etc., but the adaptability of the young engineer to a particular line and his ability to find his best place are of more account in fixing his financial returns than any general condition which may be observed. The engineer, more than any other professional man except possibly the lawyer, will find his greatest financial returns to come from his ability as a business man, his education and training as an engineer giving him advantages in many lines of business involving development of natural resources and constructions connected therewith, provided he has the faculty of managing men and affairs, which makes the successful business man.

2. Expanded metal is a special form of steel reinforcement for concrete construction used by various expanded metal companies located throughout the country, at New York and St. Louis for example. The term is sometimes used to cover all kinds of reinforcement for concrete, which is in the form of a network. Expanded metal is patented and so are some other forms and applications of reticulated steel, but there are other forms on which patents cannot be taken out. Some descriptions of methods of using such reinforcements will be found in the "Directory of American Cement Industries and Hand Book for Cement Users" ($5) and occasional statements of new applications and of the strength of structures will be found in Municipal Engineering.

3. The question of the disposition of the screenings from a stone-crushing plant is discussed on pages 384 and 385, volume xxiii of Municipal Engineering, where it is shown that the screenings are used as a filler for the top layer of stone on a macadam road, while in New York they are used with whatever additional material is required in filling the voids in the entire stone covering.

4. The custom in the two states varies as above stated. The screenings are not generally used as in New York, nor are they of any value at the bottom of the stone layer, but, if not of objectionable composition, they may be used to advantage in filling the voids in the top layer as stated.

5. It will be observed that under the New York specification the entire stone layer has about the same percentage of voids, which is probably not far from 25 per cent. Under the Massachusetts specification the top layer would have a percentage of voids probably less than 25 per cent., while the bottom layer might have 45 to 50 per cent. of voids, but if well rolled would probably have less than 40 per cent.

6. The text-books state that the early Boyden wheel attained an efficiency on test of 88 per cent. of the total of water used, and that this figure has never been exceeded, though it has been closely approached by other forms of turbine and claims of higher efficiencies have been made, but not substantiated to the satisfaction of the authors. Boyden confidently claimed 92 per cent. efficiency on a

wheel of his manufacture, but the flow of water was computed, not measured, and the claim has not been definitely allowed.

DURABILITY OF ASPHALT BLOCKS.

Have asphalt blocks made from Trinidad, Venezuelan or other asphalt mixed with gravel or fine stone and compressed given satisfaction for streets with quite heavy traffic? Where are they laid and how long since? Do not these blocks wear out about an English inch a year? Is California asphalt considered in America as being as good as Trinidad lake asphalt for paving purposes?

G. W. DEURVORST,
Merxem lez Anvers, Belgium.

Asphalt blocks have been used for paving purposes for many years, but made according to present processes only about fifteen years in America. The machinery used is patented and under the control of a single corporation. It is understood that Trinidad Pitch Lake asphalt has always been used in making these blocks. A pavement made of the blocks differs from an asphalt pavement in that the stone in the aggregate is expected to take the wear of the traffic and the asphalt serves as a cement to hold the particles of stone together and at the same time is elastic and pliable enough to prevent brittleness in the blocks and to cause them to weld together to some extent along the edges under the traffic in the heat of summer and thus form a pavement which is very nearly continuous. The compression to which the blocks are subjected is greater than that used in laying sheet asphalt, and this adds to the durability of the blocks.

The early pavements of this sort were laid with blocks made of rather soft stone, such as limestone, and were not entirely satisfactory on the score of durability. But few, if any, were laid on streets of heavy traffic, and so far as the writer's observation extends the wear was much less than an inch per year. Later, harder stone has been used in the aggregates, such as trap rock and what is known as copper sand, being the refuse stone from the reduction of Lake Superior copper. Granite is reported to be unsatisfactory.

Asphalt blocks are reported to have been laid in this country first in San Francisco in 1869. With this exception they have been longest in use in Baltimore, Washington, Philadelphia and New York. Over fifty cities and towns have asphalt block streets in use. A description of the method of laying a street will be found in Municipal Engineering, vol. xx, page 158, and the methods of making the blocks with a statement of the qualities of various materials used for the aggregates will be found in vol. xvi, page 259. Gravel does not seem to be acceptable to the manufacturers of the blocks as a material for blocks.

Some streets have been laid with California asphalt. There are many kinds of asphalt, asphaltic sand and asphaltic rock in California, some of which are good for paving purposes and some are not. In the California climate and conditions of traffic some of these asphaltic deposits make reasonably good streets which could not be used for streets under other climatic and travel conditions. The treatment of the asphalt must be different from that of Trinidad asphalt and good streets can be laid by those familiar with the material and its use in streets.

COST OF LAYING ASPHALT SURFACE.

Can you tell me what it costs to lay a square yard of asphalt street surface?

M. A. M., Erie, Pa.

This is an item of cost on which no data have been published. The actual work of mixing the asphalt, carrying it to the street and laying it may be computed from the number of men and teams employed and might easily vary say from 25 to 50 cents a square yard, but the cost of the materials, asphalt, sand, limestone, etc., the fuel, the waste, the lost time of men, the expense of the plant when idle, are all terms which have great variation and the companies laying asphalt are very careful not to give information concerning them, even when their accounts are kept in such shape that they could be determined. By deducting the cost of preparation for the asphalt surface from the total cost of pavement on contracts where the price bid probably gave no profit it has been estimated that a minimum cost for the asphalt surface, including labor and materials is about $1 a square yard, but this is doubtless exceeded in many cases and would hardly be a safe figure on which to base a bid unless a large percentage were added for contingencies and contractor's profit. In most cases the sum of the cost of the surface coat in place and the contractor's profit is from $1.50 to $2, after deducting the excavation and the laying of concrete.

HAND STREET SWEEPERS.

We would be pleased to hear from you on hand street sweepers like those shown in advertisements in your last number, as to whether they are practical and what cities use them. J. K. S.

Two automatic hand street sweepers were described in Municipal Engineering, Vol. xxiii, page 79, one of which is not on the market. A report of the action of the other machine there described, the Atkinson pick-up hand sweeper, will be found on page 300 of the same volume, as made by a representative of this mag-

azine. This report shows that it is a practical machine, which promises to make considerable saving in wages of men employed in street cleaning. This machine is made by the Sanitary Street Sweeping Company of Washington, D. C., who can give information as to the extent of its introduction in the short time since it has been put on the market.

OBJECTIONABLE PROVISIONS IN BRIDGE SPECIFICATIONS.

I send you a plan and specifications for bridge work and have marked the worst points in them and you may see others, thinking you would be willing to comment upon them for the consideration of others. SUBSCRIBER. —, Ill.

The specifications received with this letter seem to have been prepared rather carelessly and to be difficult of application strictly according to letter from the point of view of either contractor or corporation. They can be used in the same manner as specifications prepared for the benefit of favored contractors, who, knowing the manner in which they will be enforced, can bid lower than those who must allow for the strict application of their provisions. The marked sections are as follows:

Inspectors shall be appointed, whose duty it shall be to point out to the contractor any neglect or disregard of these specifications, but the right of final acceptance or condemnation of the work shall not be varied in any manner by reason of any act on the part of said inspectors.

The contractor shall furnish all labor and materials of all character and description required in the erection of this work and shall assume all risks for loss or damage incurred by flood, undue settlements or other causes during the construction of the work.

Both of these provisions are very common in city specifications and in their original application were and are salutary and quite unobjectionable. Contractors sometimes object to the first one on the ground that inspection is supposed to inspect and that further revision by engineer or committee of work approved by subordinates is therefore not necessary. Unfortunately, inspectors, even the most competent, cannot always be depended upon, and under the ordinary municipal conditions incompetent men, and men unacquainted with the wiles of some contractors, pass materials and work which are evident violations of specifications. Dishonest methods of closing the inspector's eyes are not unknown. To save the loss in quality of work or in money which would result from a specification giving the inspector the final control over the acceptance of work, the clause quoted is inserted in most city specifications. If honestly administered it has no terrors for the contractor who does his best to fulfill the requirements of the specifications, and it does have the effect with many contractors of improving the quality of work which can be easily inspected after completion, as well as of insuring the replacing of any scamp-work, no matter when it may be discovered. It does give an opportunity for a "hold-up" by dishonest officials before the work is finally accepted and paid for, but the contractor with clean hands will have no fear of the result of an appeal to the courts if the demands are excessive. Such robberies are not often committed and on the whole the provision is one which is salutary and unsatisfactory only in exceptional cases.

As stated, the second provision quoted is ordinarily applied to less important structures than bridge piers and its form may be somewhat changed for that class of work. Its appearance here without such change is another evidence of the carelessness with which these specifications have been prepared. Objection may be made to the responsibility of the contractor for "undue settlements or other causes" in a foundation whose design and method of construction are definitely prescribed by the engineer or as definitely approved by him. It is hardly probable that the courts would uphold a construction of this provision which would relieve the corporation of the consequences of a decision by its engineer under ordinary circumstances, so that this provision again may be considered as a protection of the city against incompetent or dishonest inspection, and the safety of the contractor might lie in his requirement that the engineer or committee should directly and officially approve of the foundation. The circumstances of the particular case would be taken into account and the decision of the court doubtless would be on the side of equity. The question of the competence and honesty of the engineer or committee might enter, and an attempted fraud by the contractor would operate against the approval of his claim. This provision is quite generally included in municipal specifications and is fairly satisfactory when properly modified to suit the conditions of the work for which the specifications are prepared.

MUNICIPAL MATTERS IN COURT

Higher Courts—Responsibility for Pavement—Damages by Flood—Municipal Plant Illegal—Paving Assessment Valid—Franchise Extension Enjoined—Nebraska Curbing Case—Jurisdiction in New York Bay.

Abstracts of Decisions in the Higher Courts.

Prepared by George H. Murdoch, Jr.

Assumption of Authority—Assumption of authority by the city engineer to suspend a deputy engineer held not ground for an action in damages. De Armas vs. Bell, City Engineer et al., 33 So. Rep. (La.) 188.

Change of Grade—Damages—A city can only be held responsible for the acts of its officers and agents in changing the grade of a street when the change is authorized by ordinance. Gardner vs. City of St. Joseph, 71 S. W. Rep. (Mo.) 63.

City Electrician—Salary—A city charter provided that the council should fix the salaries of certain named employes, not to exceed specified amounts, and that of "any other officer or agent," not to exceed $1,200. The council passed an ordinance authorizing the commissioner of public works to contract with plaintiff, an electrician, "for the overhauling, repairing and revising" of the city's electric light wires and lighting system for eight months, for $1,200, payable in monthly installments of $150, and contract was made accordingly. Held, that plaintiff was a city officer, and hence that the ordinance and contract constituted an evasion of the charter, and were void. Alden vs. Campbell, Mayor, 70 Pac. Rep. (Wash.) 1094.

Contract with Member of Council—A member of the common council of a village cannot lawfully enter into a contract with the municipality for his own benefit, depending upon authority derived from a vote of such a council. Stone vs. Bevans et al., 92 N. W. Rep. (Minn.) 520.

Damages Incurred While Bringing Streets to Grade—A city is not liable at common law for damages to abutting property caused by bringing streets to an established grade, and such liability, if any, is entirely statutory. Reilly vs City of Ft. Dodge, 92 N. W. Rep. (Iowa) 887.

Delay in Completing Paving Contract—A city did not waive its right to liquidated damages for delay in the paving of a street by permitting the contractor to begin and complete the work after the time limit in the contract had expired. Hipp et al. vs. City of Houston, 71 S. W. Rep. (Tex.) 39.

Error in Plans—Effect on Contract—Contractors entered into a written contract with a city for the building of a sewer under an agreement to prosecute the work from as many different points and at such times as the city might determine, and to keep the work free from water at their own expense. They had full opportunity to examine its location. Held, that they could not, after completion of the work and payment, recover for extra work upon the ground that they relied upon the plan of the work furnished by the city, which falsely indicated another sewer as then existing, and that, if the other sewer indicated had in fact existed, they could have drained the water from their work into such sewer, and saved the cost of pumping the same. Cunningham et al. vs. City of New York, 79 N. Y. Supp. 401.

Indebtedness Exceeding Limitation—Municipal warrants issued for labor and material furnished in the building of a city jail, services in guarding quarantine patients, publishing notice and printing ballots of election, feeding impounded stock, boarding city prisoners, insurance on city buildings, services in making assessment rolls, postage and stationery for officers, city printing and the necessary expenses of the city clerk, were valid, though the city had exceeded the limit of its indebtedness, as such were necessary expenses incurred in maintaining its existence. Gladwin vs. Ames, Treasurer, et al., 71 Pac. Rep. (Wash.) 189.

Opening Streets—Damages—The measure of damages which may be recovered by a property-owner from a city for opening a street along her property is the difference in the market value of the property with the improvement and without it; and the city is not entitled to offset any future increase in the value of part of the property, in common with the public, because of the improvement. Mayor, etc., of City of Meridian vs. Higgins, 33 So. Rep. (Miss.) 1.

Paving Street Car Tracks—Where the charter of a city provides "that all street railway companies now existing or here-

after organized therein shall be required to pave or repave between and to one foot beyond their outer rails at their own cost," the city council has no authority to assess the adjoining lot owner with the cost of paving such part of the street. Wales vs. Warren et al., 92 N. W. Rep. (Neb.) 590.

Private Ownership of Sewer System—Mills' Ann. St. sec 4,403 subd. 10, confers on municipal corporations power to construct sewers, regulate their use, and, for the purpose of their construction, to make special assessments against adjacent lot and lands. A municipality adopted an ordinance purporting to grant to a private individual for twenty years the exclusive right to construct, maintain and operate a sewer system within its limits, and to collect from persons using the same a reasonable annual compensation, not exceeding $50 per year, per lot. Held, that as the city had no power to turn its sewer system, present or prospective, over to private ownership, and as it itself had no power to charge an annual rental for the use of such a system, and so could not delegate such an authority, the ordinance was invalid. Weaver et al. vs Canon Sewer Company, 70 Pac. Rep. (Colo.) 953.

School House—Change of Purpose—Citizens who have voted to tax themselves for a specific work of public improvement, the value of which is fixed at $20,000, have a standing in court to complain that the property acquired is not being used for the purpose contemplated, and this court in such a case has jurisdiction of the appeal. Where a vote has been taken upon a proposition to impose a tax to build a school house, and has been favorably acted on, and a building has been constructed with the proceeds of bonds predicated upon such tax, it would be a breach of faith to allow such building to be converted into a theater, or to be used for the purpose of giving theatrical performances, as a business, whether in combination with its use for school purposes or otherwise. It is, however, within the discretion of the municipal authorities having control of the property to make such casual and incidental use of it as may not be inconsistent with or prejudicial to the main purpose for which it was acquired and changed condition in the future may justify its use for some other purpose. Sugar et al. vs. City of Monroe et al., 32 So. Rep. (La.) 961.

Surface Water—Diversion Into Water Course—Each overflow of land caused by the action of a city in diverting its surface water into a stream on which the land bordered, without enlarging a culvert, through which it was required to pass, to such an extent as to carry it off, constituted a separate trespass, and limitations ran against it from the time that it occurred, and not from the time when the action of the city was taken which caused the water to be diverted. Finley vs. City of Williamsburgh, 71 S. W. Rep. (Ky.) 502.

Use of Town Name—A town cannot maintain a suit against a railroad for giving its name to a station near it, any cause of action for the inconvenience and confusion arising therefrom belonging to passengers and shippers. Gulf & S. I. R. Co. vs. Town of Seminary, 32 So. Rep. (Miss.) 953.

Contractor Held Responsible for Damage to Guaranteed Pavement by Flood.

A decision was rendered recently by Judge Dixon in the case of John R. Lee vs. city of Paterson, N. J. The suit was brought to recover a sum of money that Contractor Lee alleged belonged to him for paving done for the city in River-st. and Hamilton-ave., and which was partially destroyed by a flood. The payment of 5 per cent. that had been held back according to the terms of the contract was asked for. When the contract was made a clause was inserted providing that 5 per cent. should be held back for a period to allow of repairs if any section should prove to be at fault. A flood in March, 1902, injured the pavement and Mr. Lee was asked to repair the damage. As the damage was caused by no fault on his part, he thought it an unreasonable request. The city finally had the work done at a cost of $1,050. The jury decided in favor of the city. Defective places still remain in portions of the pavement, and when these are remedied Mr. Lee can recover his percentage less the cost of the repairs made.

Leavenworth Cannot Build Water Plant.

A decision rendered by Judge Gillpatrick of the district court Jan. 23 at Leavenworth, Kas., made permanent the injunction asked for by the water works company to enjoin the city from issuing bonds with which to either build or purchase a new plant. The water company claimed that the ballots used in the election were illegal; that the proclamation was illegal; that the petition was illegal; that the election was illegal. The company claimed that the duality of the proposition was misleading in that the voter could not cast his ballot intelligently, as for instance, if a voter desired to cast his ballot for building a new plant, but not to buy the old one,

he was unable to make known his desires. The city attorneys contended that the actions of the city were legal throughout and that the people, through the laws or acts of 1897, had a perfect right to either build or buy the water plant.

Judge Gillpatrick held that the law of 1883 was valid and that the provision as to what the city should do is laid down therein. He sustained the water company in its contention that the voter was unable to express his desire as to whether he wished to build a new plant or to purchase the old one. He stated that the ballot was misleading and that the result gave the city council and mayor too much power where the object of the law is to restrict that power. Also, that the bond proposition was illegal. An appeal to the supreme court will be taken.

Davenport Paving Assessment Case Decided in Favor of City.

A decision has been rendered by Judge McPherson in the case of the city of Davenport, Ia., vs. William Russell Allen and others. The suit involved the cost of paving Eddy-st. and Le Claire road with brick. The original suit was for $14,675.26, but the amount now, with accrued interest, is about $20,000. When the paving was completed the owners of the Allen property refused to pay for the paving on the ground that the city could not collect the assessment taxed. The district court ruled in favor of the plaintiffs, who secured an injunction preventing the city from collecting the amount. The case was taken to the supreme court, where the decision of the lower court was affirmed. The city then appealed to the federal court, making a new case of the matter and asking that the city be allowed to collect for the reasonable amount of the cost of the material and labor. The supreme court sustains the demurrer of the plaintiff, and the city can recover for the reasonable value of the labor and the cost of the material used in the construction of the pavement.

Injunction Against Extension of Omaha Water Works Franchise.

The Nebraska supreme court has rendered a decision reaffirming its previous affirmation of the action of the district court in the suit of Wm. S. Poppleton against Mayor Moores and the city council, in which he sought to enjoin the extension of the franchise of the Omaha Water Company. Under this decision a permanent injunction now restrains the mayor and council from granting an extension of the franchise. The suit has been pending for five years.

The city passed the present water works franchise ordinance in 1880. The franchise was for 20 years and provided that at any time after 20 years the city should have the right to buy the plant at an appraised valuation and pay nothing for the franchise. During the '90s the company began in an effort to secure an extension of the franchise, or rather a postponement of the city's right to purchase. In December, 1896, an ordinance to purchase was introduced in the council and its passage was frustrated by a restraining order issued by Judge Keysor at the instance of Herman Kountze, J. H. Millard, C. W. Lyman, J. A. McShane, W. S. Poppleton and Guy C. Barton. Before the case could be heard on its merits the council was legislated out of office by the present charter. The question was made an issue in the campaign, and although a council standing on a platform pledged against the extension was elected in 1897 the ordinance was again introduced in April of that year. It was defeated and the matter was allowed to rest until December, 1897, when the council and water company sought to take advantage of the situation under the guise of the necessities of the Trans-Mississippi exposition. The company refused to furnish water to the exposition unless the city would postpone the right to purchase until 1908. The company urged that without the concession the company could not make necessary extensions to furnish the water; that without water there could be no exposition; and that any one who opposed the extension was, therefore, an enemy to the exposition. On Dec. 14 an ordinance was introduced postponing the city's right to acquire the water works plant until September, 1908. William S. Poppleton then began suit to enjoin the action. Former Judge Scott granted the injunction and made it permanent, after City Attorney Connell had made a vigorous fight against the injunction in the district court. The water company appealed to the supreme court, where the action of the lower court was affirmed. The water company secured a rehearing and in September, 1902, the case was again submitted, with the result that the decision just rendered reaffirmed the action of the district court and established the permanency of the injunction.

A Nebraska Paving and Curbing Case.

The case of Robert A. Batty et al. vs. the city of Hastings, Neb., involving about $5,000 in special and curbing taxes, has been re-entered in the district court. The suit was brought in the district court of Adams county to enjoin the collection of special paving and curbing taxes on the ground that proper petition had not been presented to the mayor and

city council asking that these improvements be made. The district court sustained the plaintiffs and made the injunction perpetual. Appeal was made to the supreme court, but the judgment of the lower court was affirmed. A motion for rehearing was filed, but was overruled and the clerk of the trial court was given a mandate to carry into effect the former judgment. On Feb. 3 W. F. Button, city attorney, appeared before the supreme court and filed a motion for a rehearing on the ground that the former judgment was wrong. This motion was sustained, the mandate recalled and permission given to file a motion for rehearing. City Attorney Button has insisted, ever since his appointment, that the fact that the petition for the paving had been found defective did not in any way affect the curbing tax. He claims that the city council has the right to order any street curbed which has been ordered paved, and that the cost of the same may properly be charged to the abutting property, even if no petition was presented.

Jurisdiction of New Jersey Over Its Portion of New York Bay Established.

The Passaic Valley District Sewerage Commission has had its attention called to the decision of the New York Court of Appeals, which establishes in a conclusive way not only the boundary line between the state of New York and the state of New Jersey in the waters of the Hudson river and the New York bay, but the jurisdiction of the two states over these waters. The decision was rendered in the case of "The people of the state of New York vs. the Central Railroad Company of New Jersey." The action was brought to prevent the Central Railroad from building a pier about one mile in length from the Jersey shore into New York bay, on the contention that the structure was not only an obstruction to commerce and navigation but created a public nuisance and being filled with garbage and refuse from Jersey City was dangerous to public health. The case was tried in 1870 in the court of appeals. The court in presenting the state of the case said:

It is claimed * * * that the said erections are within the limits and jurisdiction of this state, and that the same are an obstruction to navigation, * * * injurious to public health * * * and constructed without any lawful authority. The complaint sets up, as the basis of the plaintiff's claim to jurisdiction over the waters of the bay and river, a treaty or agreement made between the two states in 1833, wherein and whereby the jurisdiction claimed was conceded and yielded to this state. The complaint prays that * * * the defendants be perpetually restrained by injunction from using and occupying said docks, * * * and also from filling in with stones, earth, * * * any part or portion of the waters of said bay and of the Hudson river west of Manhattan Island.

This opinion establishes that the boundary line between New York and New Jersey is the middle of the Hudson river, the Bay of New York, the waters between Staten Island and New Jersey and Raritan Bay to the main sea except the two islands—Bedloe's and Ellis. The state of New York retains a qualified and limited jurisdiction for police and sanitary purposes to promote the interest of commerce, over the waters to low water mark on the New Jersey shore. The state of New Jersey has, however, exclusive jurisdiction and control over the piers, wharves, docks and other improvements erected or to be erected along the shores of that state, and this jurisdiction embraces the whole subject of such improvement, with power to prescribe when, where and how they are to be erected, and to exercise all control over them which government can possess over the property of private citizens.

The court held that the courts of New York had no jurisdiction over the subject matter, and that if the erection of the pier, wharves, etc., complained of was a public nuisance, the courts of New Jersey had exclusive jurisdiction over them. In fact, the opinion declares that a corporation or individual having due authority from the state of New Jersey might even go to the extent of filling in the land to the line established, as marking the boundary, without coming within the jurisdiction of the New York courts, and relief in such a condition of affairs could only be obtained in the courts of that state.

CITY GOVERNMENT AND LEGISLATION.

Parkways and Boulevards in Philadelphia—Choosing City Engineer—Salt Lake City—St. Louis Bonds—Milwaukee Pavement Guaranties—Census Statistics.

Park Way and Boulevards for Philadelphia—An Addition.

Mr. William B. Bray, the author of the leading article in this number of Municipal Engineering, sends the following information regarding the action of councils on the Parkway project on Feb. 19, which arrives after the first pages have gone to press:

Councils' survey committee, on Feb. 19, approved and reported to councils a substitute ordinance for the pending Parkway. The deviation from the old plan is principally in widening the approach at the City Hall end of the thoroughfare and increasing the width at the Fairmount Park end, to nearly 600 feet, taking in Pennsylvania-ave., as proposed in the Kelsey plan, and other surrounding properties at the park entrance, which have been a blot on the beauties of the vicinity for years. This plan has every prospect of going through council at its next meeting early in March.

The Methods of Choosing City Engineers.

In a paper before the Iowa Engineering Society, presented by A. Marston and G. W. Miller, the authors state that they have corresponded with the city engineers of twenty-five cities regarding the methods of appointment to their offices.

In Iowa election by the people is at present the popular method. A table was presented showing that in Baltimore, Md.; Columbus, O.; Memphis, Tenn.; Milwaukee, Wis.; Salt Lake City, Utah; Omaha, Neb.; Rochester, N. Y.; St. Paul, Minn., and St. Louis, Mo., the city engineer or the equivalent officer is appointed by the mayor; in Buffalo, N. Y., and Detroit, Mich., he is appointed by the commissioner of public works; in Kansas City, Mo., and San Francisco, Cal., he is appointed by the board of public works; in Charleston, S. C., and Minneapolis, Minn., he is elected by council; in Burlington, Clinton, Council Bluffs, Des Moines and Sioux City, Ia., Colorado Springs, Col., Lincoln, Neb., and New Orleans, La., he is elected by the people, and in Chicago, Ill., and Philadelphia, Pa., he is appointed under a system of civil service. The term of office varies from two to four years, except that in Buffalo and Detroit it is at the pleasure of the commissioner, in Kansas City and San Francisco it is at pleasure of the board, and in Chicago, Columbus and Philadelphia it is during good behavior. In Buffalo, Chicago, Columbus, Milwaukee, Philadelphia and San Francisco the employes of the office are under civil service regulations; in Baltimore, Burlington, Clinton, Council Bluffs, Des Moines, Lincoln, Memphis, Salt Lake City, Omaha, St. Paul and Sioux City they are appointed by the engineer; in Detroit, Kansas City and St. Louis they are appointed by the commissioner or board, who also appoints the city engineer; in the other cities the method of appointment is not stated.

Quotations from letters of city engineers are given favoring every method of selection given. In conclusion the paper says:

It would appear that there is considerable diversity of opinion among city engineers as to the best method of making selections for the office, and the authors of this paper desire to state here very emphatically that they have no panacea to present as an unfailing cure for all the ills the engineer and public are heir to in this matter. We have called attention to the ills, and in addition we wish merely to lay down a few principles which we think should help guide the steps of progress in this matter.

First of all every one can agree to the principle that the city engineer should be selected and retained in office for merit alone. Political affinity should not be taken into account in the slightest degree. The only question at all debatable is how to bring this about.

To place the office under civil service regulations will naturally occur to the thinker on this subject, but it seems evident that this method in its usual form can only be adopted by those cities large enough to maintain a competent civil service commission without finding the expense a serious draft. Moreover there are so many qualifications for a city engineer which can not be properly taken into account in any examinations that there is room for serious doubt whether such responsible positions can not best be filled by direct appointment by some intelligent and honest appointing power. Even where civil service regulations are adopted for selecting the city engineer the appointing power should be allowed

to give very great weight to those qualifications which can not be determined by examinations.

In the majority of cities, and especially not of very large size, it seems probable that the city engineer must, at least for a long time to come, continue to be selected by means very similar to those now in use. Any of these means, whether by election or by appointment by mayor, Council or Board of Public Works, is capable of giving most excellent results if administered on the basis of appointment for merit alone, and does in some cases give excellent results. Any of these means, on the other hand, is subject to most deplorable abuses when not administered on the basis of merit.

The question is, then, how to make the consideration of merit the important thing, no matter what method of appointment is adopted.

It would seem, in the first place, that the law ought to carefully specify the qualifications for the office. This is not the case in Iowa, and our law should be amended. Of course it would doubtless be possible to evade legal requirements, but the fact that such requirements existed would help. The law should specify that the appointee should be a civil engineer of a certain training (not necessarily school training), and of a certain number of years experience, and that he should have a high professional standing. If we ever succeed in getting our state license law for engineers, a state license should be one of the requirements. Could not the law require that the professional standing of the appointee be certified by a temporary board, one at least to be a civil engineer selected by the president of this society?

In the second place, the tenure of office ought to be during good behavior. Of course this would carry with it that either the Board of Public Works, the Mayor or the Council should have the power of removal for cause, and they ought not to be so hampered in this respect as to enable an incompetent man to hold on to his position, but the engineer should be given the right to a public hearing before removal, and should have redress in the courts against injustice. Making the tenure of office during good behavior would go very far toward rendering it impossible for men to obtain the office merely as a reward for political services. Moreover, it takes about one of the present terms of office to enable a man to become thoroughly acquainted with the local conditions and requirements of his work, and it is absurd to dispense with his services just as they become most valuable.

In the third place the appointment of subordinates in the city engineer's department ought in all cases to be on a civil service basis. In cities too small to maintain a civil service commission the examinations could be conducted by the engineer, assisted by other members of an examination board appointed temporarily or permanently by the mayor. The engineer should have the right to select from the eligible list, and should also have the power of making removals for cause, after a public hearing given the person removed. Putting the engineer's force on a merit basis will help remove the city engineer's office from politics, for it would then be impossible for any one to demand from him promises of appointments in payment for votes and other assistance. Also it will help the quality of the city engineer's work to have his force permanent, so that when a new city engineer is appointed he may at once have the benefit of the advice and experience of subordinates thoroughly familiar with the local conditions and the routine of the department's work.

The authors do not profess to have worked out all the details satisfactorily, but they are of the opinion that if the three suggestions of rigid legal qualifications of appointee, tenure of office during good behavior, and appointment of subordinates on a civil service basis could be properly elaborated and embodied in our state laws, and a conscientious effort made to enforce the laws, much would be found to have been accomplished toward eliminating the evils both to the public and to the engineer resulting from the present conditions.

Water, Light and Paving in Salt Lake City.

The annual report of Honorable Ezra Thompson, mayor of Salt Lake City, Utah, embracing the reports of the various departments, has been submitted to the city council. The report of the street lighting department shows the number of street lamps to be 450, exclusive of five 16 c. p. lamps on Eagle gate and 10 free arc lights furnished under the lighting franchise. The contract price for the various lights for the year was $31,274.60. A discount of $1,075.65 was made for outage, making the net cost for street lighting during the year $31,198.95.

The expenditures of the water works department during the year were $45,150.50. During the year about 70,000 ft. of water main extensions were laid. The city now has 153 miles of water mains. Superintendent Hines again recommends that all "dead ends" be extended to connect in circuits as rapidly as possible. Also that all wooden flumes and tanks in City

creek be replaced by brick or stone. He adds that concrete would probably be the best material to use.

The city engineer's report shows that during the year improvements were made as follows:

Water-main extensions	$ 28,638 92
Sewer extensions	41,691 05
Sidewalk extensions	5,167 35
Street pavements	211,601 65
City creek pipe line	27,947 73
Main sewers	3,954 66
Garbage crematory	12,680 35
Surplus ditches	4,398 74
Miscellaneous	6,903 54
Total amount	$342,993 99

The city engineer recommends the construction of a reservoir of at least 5,000,000 gallons capacity near the high line intake in City Creek canyon. Mayor Thompson urges that East South Temple st. be paved. He says:

If, on an average, the city would pave from six to ten blocks every year, before many years such improvements would greatly add to the comfort, attractiveness and beauty of our city. What I have said about street paving is equally applicable to the pavement of sidewalks. We are in the midst of a prosperous era, and should take advantage of it for the purpose of making permanent improvements.

Legality of Proposed St. Louis Bond Issue in Question.

In a verbal opinion to Mayor Rolla Wells of St. Louis, Mo., Feb. 12, Dillon & Hubbard, experts in municipal government, New York City, declared that the charter of the city of St. Louis does not authorize the mayor and comptroller to issue bonds. They stated that if the $8,000,000 worth of bonds proposed should be issued their validity might be questioned. Judge Dillon says there is nothing in the charter forbidding the selling of bonds. The fault lies in the fact that since there is no clause specifically authorizing the mayor to incur debt, it is a sin of omission rather than of commission, and he regards it as advisable to adopt the conservative course. The mayor could proceed with the sale of bonds, but a question might arise later as to their validity which would cloud the issue and perhaps seriously detract from the market value. It will not be necessary, however, to submit the matter to the state legislature. The voters of the city are supreme so long as the amendment which will be presented to them for approval does not conflict with the constitution of the state. The matter will be placed before the electors of St. Louis, requesting that a clause be inserted in the city charter empowering him to issue bonds to meet the urgent needs of the city.

Under the recently adopted constitutional amendments the municipal assembly can call a special election. No very great delay will be suffered, therefore, in procuring the money for the much-needed public improvements.

Milwaukee Asks Power to Require Stronger Pavement Guarantee.

A bill has been recommended by Mayor Rose of Milwaukee, to be introduced at the present session of the Wisconsin legislature, to give the city the power to require a ten-year contract from asphalt paving companies; to reserve 20 per cent. of the contract price upon which the city is to pay interest at the rate of 2½ per cent.; to require a surety bond from the contracting company for one-half of the contract price; granting property-owners the right to decide the kind of pavement to be used.

U. S. Census Statistics of Cities.

A favorable report was authorized recently by the house committee on census on a bill directing the census bureau to take municipal statistics of cities of 30,000 or more in the year 1905, and biennially thereafter.

STREETS, ROADS AND BRIDGES.

Highway Bridge Economy—Bitulithic Pavement—Nebraska Bridge Lettings —Netherlands Tramways—Columbus Interurbans—Outlook for Work— New York Appropriations—American Asphalt Rock for Paving.

More Economy in Our Highway Bridges.

In a paper with the above title, read at the recent convention of the Indiana Engineering Society, Mr. Frank L. Wolfer said:

In this paper I will endeavor to tell you what I have for some time thought of the modern methods used in the highway bridge business.

We have agents to sell highway bridges, but not railway bridges. Each company has its agents, who keep a close eye on all proposed bridges, and it is of these agents that I will first speak.

There is in Indiana, I believe, a law providing that contracts for bridge letting must be secured by public lettings and not by private contracts. This law also provides that there shall be no pooling of the bids, but this is much more easy to say than to do, for we cannot compel a man or company to bid lower than another against his will, nor can we very easily prevent the bidders from comparing their bids, provided they are careful not to tell us that they are doing so. You all, no doubt, know what I mean by "pooling." It is simply an agreement by which one company secures the contract for a job by increasing its bid enough to pay each of the other bidders a certain amount for this privilege. There is no great wrong done by this, in fact, nothing more than that the state or county must pay this premium to those bidders who wish to secure the contract, which, in some cases, may be very small or nothing, and in others may be well worth considering.

In Indiana the law requires all bridges, the cost of which is greater than $3,000, I believe, to be designed by an engineer, which provides that all of our bridges will be properly designed; but it is not of this that I wish to speak, for the competition in our highway bridge work has become such that our highway bridges are receiving more careful designing now than ever before.

In comparing bids and designs upon a bridge a county commissioner oftentimes decides upon the price which he thinks should be paid for the structure by comparing it with some similar structures, built perhaps under very different conditions, and to thrust upon a commissioner the responsibility of determining these costs, which require the careful estimate of an engineer to determine, seems to me, to be too much.

The cost of any structure may, as you know, vary greatly at different times with the cost of the materials and labor, and may be determined to some extent by the location, and a close estimate would be necessary to determine this.

In many instances there are, say, ten companies invited to submit designs and bids upon a certain structure, and there will be ten or more bids, all perhaps upon different designs, which, while it affords an opportunity of comparing several designs of different character and enabling us to determine which is most desirable to meet the requirements, at the same time means that at least nine or more of these designs are made and perhaps never used, which expense is thrown upon the bridge companies, who, in return, must come back to the buyers to cover the expense.

A plan used to some extent in Indiana is for one bridge company to be given the opportunity of putting their plans on file, and all bids are made upon these plans, which have been, no doubt, carefully designed by a competent engineer, and so this is strictly in accordance with the present law in Indiana. This scheme looks to be a very good solution of this problem, and should work very well, but it does not by any means do so in every case. For instance, one highway bridge company secures permission to place their plans on file and makes a design which is very satisfactory to the county commissioners. The bridge is perhaps 150 or 175-feet span, and the design is one which is perhaps a very graceful and good-looking bridge. The bridge is specified to be of 100 pounds per square foot capacity, and is completely designed with all sizes marked upon it. Now suppose that a hundred pound bridge would require a 10-inch 15-pound channel and one 18x5-16-inch chord section, and the plans on file show a 10-inch 25 pound and all the other members increased accordingly. The other companies must bid upon the plans on file, while the company whose plans are on file, will bid upon a lighter bridge, one that has a capacity of 100 pounds per sq. ft. as required, and the bridge that they will build will be-

yond doubt be a good structure in every way, and it will be just what is required but it will not be built according to the plans on file.

The outside companies have no alternative to bidding upon the plans on file for they would be compelled to build it from these plans, and the only thing for them to do is to submit two bids, one for the bridge as shown on the plans, and the other for a 100-pound bridge as required in the specifications.

I can recall a bridge, the plans of which were placed on file by a company, which does a large amount of highway work in Indiana, the span being about 125 feet and the bridge was "loaded" as described above until the weight, as estimated from the plans, was about 25 per cent. in excess of the amount it should have been had the bridge been designed according to the loading system.

There were eight other bidders upon this work, and many of them made two bids, one for a 100-pound bridge, and one for the plans on file, and there was quite a sensation when these bids were opened. But it is needless to say that all of the bids not made upon the plans placed on file were rejected. These designs for the 100-pound bridge were made by men who were just as good engineers as the one who designed the original, and their estimates were all about the same and about 20 per cent below the loaded bridge. The company who placed the plans on file secured the contract for the bridge as placed on file, their bid being low. The bridge was built; a 100-pound bridge was just what the commissioners wished, but was not what the other companies were required to bid upon, and was according to the laws governing bridge building in Indiana. The outside companies when the bridge was built proved that the bridge was not built according to the plans placed on file.

Now I think a law which makes this sort of methods proper is not a very good law to govern such an important thing as the bridge building of a state.

Almost every company has a large number of standard designs for highway bridges, which have been carefully worked up, and as far as the strength and design of highway bridges go, I think that they are as carefully designed as the railway structures, and I see no reason why they should not be, for the competition is greater and each designer must use his material to the greatest advantage.

Every railroad has its bridge engineer as a necessity, but there are few railroads in the country that use as many bridges as the state of Indiana. A railroad bridge engineer designs or checks the design of all bridges on his road and watches the progress of the bridge in the shop and during erection. He inspects the workmanship and material and the painting, which is just beginning to receive the proper amount of attention. There are some, but very few, who insist upon the proper care being taken during the painting and in the proper selection of paint, and many a bridge is painted over a coat of grease, in the rain and during zero weather, and then we wonder why the paint does not stay on longer. Most railway companies have their inspectors who watch the progress of the work very closely, and while some of them do some harm as well as good, I think that if an inspector be a man of experience and of good judgment he can and will insure good workmanship and material and at the same time will not delay the manufacture to any extent.

Many of our highway bridges are now being used by electric railroads and are becoming more and more upon an equal basis with railway bridges, and yet many of our highway bridges are being built without inspection at all, and while I know that our bridges are now better designed and built than ever before, I think that at a very small expense they could be materially bettered. Think of the number of highway bridges in this state and then think of the number of men there are in the proper position who can say that these bridges are properly and economically designed and are safe for present loads.

Each railroad company has its corps of bridge engineers who inspect their bridges and keep them in proper repair, and at all times know the condition of every bridge on their line, and have it removed or repaired before it becomes unsafe. We cannot expect to build all our bridges of stone or even of cement for many years to come, for our highways are not yet ready to receive them, and I believe that the life of a good steel bridge can be greatly increased by proper care during manufacture, painting, and by having it inspected during its term of usefulness by engineers who will be able to tell the condition of the bridge at any time, and whose reports will have enough weight and authority to insure the repair of any structure.

If a railway company can economically maintain an efficient corps of bridge engineers, would it not also be a great economy for a state to do so, and I wish to suggest the following scheme for such an arrangement.

Say there is an engineer of bridges appointed who will be a man of broad experience in designing and building bridges. This man will hold a position similar to the engineer of bridges of a

railroad company, and it will be his duty to check over the designs or design all bridges built, to inspect the manufacture of the bridge and to keep informed at all times as to the condition of every bridge, to submit designs and estimates for repairing and renewing all existing structures. To do this will require several able assistants. By this means at any time it is proposed to build a structure the engineer will make designs and estimates for it and the cost found, when, if found to be within the amount available for the purpose, bids may be received upon the design, thus securing a large number of bids all made upon an equal basis, and will, I believe, give better results. It would put the bridges of our state under the care of an engineer or a corps of engineers, who are competent bridge engineers. It would enable an estimate to be made upon any proposed structure and would cause the repair or removal of old structures before their condition became dangerous. Under the present conditions it is often hard to close a bridge even though it is thought to be unsafe and in some cases a street car or traction engine settles the question by wrecking the structure which might have been made safe at a small cost had its condition been fully known. The failure of a highway bridge should be almost out of the question. Many of our old bridges have done and are still doing good service, and will continue to do so for a long time if we will give them just a little care now and then.

Bitulithic Pavement for Kalamazoo.

In preparation for the laying of a large amount of paving the city council of Kalamazoo, Mich., appointed a public improvement commission consisting of three large taxpayers, J. J. Knight being chairman, and A. B. Schrid and O. K. Buckhout the other members, with George S. Pierson as consulting engineer. These four gentlemen spent much time in travel and inspection of pavements of all kinds and made a report to the council on Jan. 26, as follows:

Regarding the matter of paving, we beg to state, that this important factor in the improvement undertaken, has had our close attention and careful consideration, since we assumed the duties of our office, and since Sept. 15 more than half our time has been given up to this subject. We have made various trips, in each instance accompanied by George S. Pierson, our consulting engineer, for the purpose of investigations, occupying altogether some twenty-one days' time, and covering the following places: Grand Rapids, Flint, Saginaw, Port Huron and Muskegon, Mich.; Albany and New York, N. Y.; Boston, Brockton, Campello and Cambridge, Mass.; Providence and Pawtucket, R. I.; Ft. Wayne, Ind., and Washington, D. C. In addition to this we have been in constant communication with the city authorities in one or another of some twenty other cities. In all of these places we have undertaken to carefully and impartially investigate the merits and methods of laying all the different kinds of pavements in use in this country. We feel that we have left nothing undone which we could or should have done to inform ourselves upon this important subject, to the end that we might arrive at right conclusions.

We wish to have it distinctly understood that we have no criticism for other forms of pavement than those selected, but we believe, and there is no difference of opinion among us and our opinion is shared by Mr. Pierson, that we have selected the best pavement for use in this city. It might be well, however, to say a word regarding the pavement known as Warren's Bituminous Macadam. Your commissioners had heard of this pavement through advertisements and trade journals, but had given it no particular attention until we were making our trip through this state. At Grand Rapids, and elsewhere, inquiry was made of us, whether we had seen it, and we were advised to look it up.

At Saginaw we found a street was being built of it, and was in all stages of completion, some two blocks having been finished and opened to the public. The method of construction, the apparent stability and the beauty of the street appealed to us at once, and the words of praise we heard for it from the residents of the street, officials of the city and citizens generally, led us to take some interest in it. But, we, like some other unthinking critics with no knowledge or very superficial knowledge of pavement had been inclined to ignore it. At Port Huron we also found a street that was being laid with the same material, and we again made all inquiries possible, with the result that everybody seems to be enthusiastic over this pavement.

After visiting other cities and inspecting other pavements such as the various kinds of brick, block and sheet asphalt, creosoted wood, etc., we returned home and opened a correspondence bureau with the officials of eastern cities regarding the various pavements. We had so many words of praise and commendation regarding the Warren bituminous macadam, that, while we could illy afford to do so, we determined to go East and investigate for ourselves, not only this, but all other forms of pavement. We found the Warren bituminous macadam pavement in Boston, Brockton, Campello, Cambridge, Mass., Providence and Pawtucket, R. I. We found also that it had been laid in many other cities, but these were the only ones which we visited. The oldest of these pavements which we saw had been in use for two years and it was in perfect state of preservation. In most of

these cities we consulted with the various city officials, with citizens and everybody whom we could interest in our mission, and we are able to state that we have never heard one word of criticism from any responsible and interested person regarding this pavement. On the contrary, we heard nothing but praise for it everywhere.

Still, some of us were not quite satisfied, and we decided to go to Washington, where it was said there was a pavement of similar character, laid 29 years ago, in a very unscientific way, made of sand and gravel and the bituminous compound, instead of crushed stone and upon which we were told that less than one cent per square yard per annum had been expended for repairs. We saw this pavement, and through the courtesy of Prof. Dow, chemist and inspector of asphalts and cements for the District of Columbia, with whom we spent nearly a whole day, we were put into possession of facts which removed any lingering doubts in our minds regarding the merits of this pavement.

While east we visited the Warren Bros. plant at Cambridge, Mass., and were impressed with the great care taken in the preparation of the bituminous composition used.

Since our return home we have been in correspondence with cities in this state which have laid this pavement, and we have in our possession a letter under date of the 20th of this month, signed by a city official of Saginaw, in which he states that the pavement is proving satisfactory, and that at the present time the city council of Saginaw has ordered 50,000 yards of this pavement on streets where the abutting property owners have petitioned for it. This since the completion of the street which was in process of construction when we visited Saginaw in October. We also have a letter from Port Huron, signed by both the Superintendent of Public Works and the Mayor, stating that this pavement is giving entire satisfaction even to their "old time and inveterate kickers."

In conclusion we wish to say that this pavement is not a tar macadam. It is made of crushed granite or field stone and a bituminous composition. It is not sticky. When completed the pavement has no odor whatever. It is as handsome in appearance as sheet asphalt. It is not slippery, nor slimy when wet. It is practically noiseless. It is ideal for horses. It has been indorsed by the Road Drivers' association of New York City. It is simply and cheaply repaired. We believe it will not crack under changing temperatures, and it is not affected by moisture (the enemy of all pavements). It is the least dusty.

At the same meeting of the council bids were received for constructing 45,000 square yards of pavement, and, in accordance with the report of the commission, the contracts were awarded to the Central Bitulithic Paving Company for Warren's bitulithic pavement, also known as Warren's bituminous macadam waterproof pavement.

The mayor, in presenting the report for consideration, called special attention to the conference of the gentlemen forming the commission and of the consulting engineer, and to their direct personal interest, as large taxpayers, in securing good pavements for the city. Another bid for a bituminous pavement which was materially lower was rejected with the statement from the chairman of the commission that its quality would not be satisfactory. Mr. Pierson, the consulting engineer, was also called upon and added his oral opinion to that expressed in the above report, and emphasized the special value of the report on account of the detailed study made by the commission, in which he had participated.

The accompanying photographs show three pavements which were not visited by the commission and which would have added to their satisfaction with the material. One shows the completed bitulithic pavement on Washington-st. in Brookline, Mass., another that on Court-st. in Taunton, Mass., and the third, that on N. James-st., in Rome, N. Y.

Methods of Bridge Lettings in Nebraska.

The county legal department of Lancaster county, Nebraska, holds that bidders must base their bids for the contract for building county bridges on plans and specifications adopted and approved by the county commissioners. These plans and specifications should be prepared by some competent person and kept where the bidders may have access to them for information on which to base their bids. County Attorney Caldwell thinks this is the only way in which honest, intelligent and practical contract letting can be accomplished.

American Capital in Netherlands Tramways.

The Netherlands Tramways corporation has been formed by an American syndicate to build and buy street railroads and electric lines in Holland. The corporation has a capital of $3,500,000. It has purchased all the street railroads in the city of Haarlem, Holland, and franchises have been secured and contracts let for building a double track electric railroad to run from the city of Amsterdam to Haarlem, a distance of twelve miles. Directors were elected January 29 as follows: Henry J. Pierce, W. Caryl Ely, Charles W. Goodyear and Pendennis White of Buffalo; William B. Rankin of Niagara Falls; G. L. Boissevain, F. S. Smithers, W. W. Kelsey, J. G. White

WARREN'S BITULITHIC PAVEMENT ON COURT STREET, TAUNTON, MASS.

WARREN'S BITULITHIC PAVEMENT ON WASHINGTON STREET, BROOKLINE, MASS.

WARREN'S BITULITHIC PAVEMENT ON NORTH JAMES STREET, ROME, N. Y.

and James M. Edwards of New York, and M. J. Boissevain of Amsterdam, Holland. The officers elected were Henry J. Pierce, president; G. L. Boissevain, vice president; W. P. Little, secretary, and Edwin Henderson, treasurer.

Columbus Interurban Railway Construction.

The construction of the Central Market railway tracks in Columbus, which are part of the Appleyard lines, has just been completed by W. H. Luchtenberg, the contractor. The work was begun May 5, 1902, and sixteen miles have been constructed since then. A large per cent. of the steel rail construction was special work in the shape of crossings and curves placed at the street intersections and more than ten miles of the double track was laid on a concrete foundation in paved streets. Over a mile of the double track requires three rail tracks, the Columbus Railway company's track having a gauge of five feet two inches and the interurban track the standard gauge.

The method employed by Mr. Luchtenberg in constructing the track was as follows: The width of the track was first marked out. The bricks or paving blocks removed, cleaned and piled along the sidewalk. The stone ballast used for the foundation under the old paving was plowed up and hauled to other parts of the city to be used under and between ties on streets where there is no paving. Then the earth was taken out down to the subgrade which is twenty-one inches below the top of the pavement. This done the subgrade was thoroughly rammed and the ties were put in place resting on the subgrade; then the rails were laid and spiked to the standard gauge of four feet eight and one-half inches.

The rails are the Trilby groove, nine inches high, 60 and 62 feet long, weighing 107 pounds to the yard. Each joint between the rails was doubly bonded with heavy protected bonds placed under the splice bars. After the rails were spiked to the ties and properly bonded the ties and tracks were raised to the hight of the pavement and paving brick was placed under the ends of every third rail. The track was then brought exactly to the grade by using oak wedges on top of the blocks under the rails. By so doing six inches of room was left for the laying of concrete underneath the ties.

The utmost care was taken in making and placing the concrete. On the concrete boards he placed two parts of clean sharp lake sand and one part natural cement, and they were thoroughly mixed while dry. Sufficient water was then added to make a good stiff mortar. He then dumped four parts of clean crushed gravel or rock into the mortar and the whole was thoroughly turned with shovels by hand. It was shoveled and tamped under the ties six inches deep for the road bed. This left nine inches to the top of the rail to be filled with brick or paving block and its foundation. The cost of the double groove rails for one side of each of the double tracks, where the two gauges were necessary, has been very great. The cost of constructing the double curve at the corner of 4th and Chestnut streets alone was $8,000.

American Asphalt Rock for Pavements.

The twenty-second anual report of the U. S. Geological Survey contains an extensive paper by George H. Eldridge describing the various asphalt deposits in the United States. It contains tables giving comparisons of the results of analyses of various foreign and American asphalts. One of the regions described is that in western Kentucky supplying asphaltic sandstone which has been very successfully used for pavements, and for this reason will be of special interest to many readers of Municipal Engineering. The counties in which the principal deposits occur are Grayson, Breckenridge, Edmonson, Warren and Logan.

Professor Charles F. Very of New Albany, Indiana, was the discover of the Kentucky asphalt rock. In 1881 he raised some capital and secured a few smaller tracts. W. L. Breyfogle of Louisville, Kentucky, became interested, and the Breyfogle quarries in Grayson county were opened. Some of these properties were merged in a Kentucky company and were developed as sources of material for pavements. The capital engaged was not sufficient and the mechanical equipment was inadequate, but pavements laid even under these disadvantages are now in constant use and in excellent condition. The company finally discontinued business on account of these limitations. New companies sprang up and the companies using foreign asphalts were strong in their opposition, so that prices were cut in many instances so low as to result in loss to paving contractors.

Attempts of opposing companies to secure the main deposits were ineffectual and very recently a careful examination of the material by prominent Chicago financiers under the supervision of competent men resulted in a large accession of capital, and a consolidation of the smaller companies, which brings under one control over ninety per cent. of the known deposits. The company is known as the Federal Asphalt Company and contains a large number of stockholders who have made other financial successes

in banking, manufacturing and other pursuits.

Ninety-six tracts in Kentucky are held by the company of which each of the five largest is estimated to contain more asphalt than is in the famous 114 acres on the island of Trinidad. Additions to the present mills of the company, which will make this the largest plant of the kind in the world, will be ready for use before this year's paving season opens, placing them in position to supply any demands for asphalt paving material which may be made.

The analyses above referred to show

BRAINARD BORISON,
Vice-President Federal Asphalt Company.

that the asphaltic sandstone from Kentucky contains pure bitumen and sharp quartz, fine to coarse in grain, with nothing else. It is free from clay, soluble salts, vegetable matter and other foreign matter found in many other deposits and contains no limestone. The natural rock as found in the quarry is milled to a uniform quality of correct formula and shipped ready to be used in pavements, nothing being added. Pavements made of this material do not have the tendencies to polish and become slippery or to crack, all of which are characteristics of mixtures containing limestone, and moisture does not affect them. The uniformity and simplicity of the mixture makes the pavement of uniform quality.

The methods of the Federal Asphalt Company are entirely different from those of other American asphalt producers, from the fact that the manner of occurence of asphalt rock makes it possible for them to furnish the paving contractor with the material for the wearing surface of the pavement ready to put in place with only sufficient heating to enable it to be properly spread and compacted. This is a great advantage to contractors as it makes the laying of the pavement a very simple matter. This also lessens the cost of laying, as it does away with the expensive mixing plant and with the danger of injury to the material in the mixing process from carelessness or incompetence when expert operators are not obtainable.

These facts make reports of the condition of streets laid with Kentucky rock asphalt of interest and a few statements from city engineers and others regarding their experience with this material follow:

George W. Tillson, Chief Engineer of the Bureau of Highways of Brooklyn and author of a standard book on pavements and paving materials, wrote to William C. Redfield, Commissioner of Public Works, under date of January 21, 1903, as follows: "I have always been well disposed to Kentucky rock asphalt pavement and think that a proper rock asphalt pavement will outlast any of our Trinidad or similar pavements."

Major J. W. Howard, for twenty years a consulting engineer for the Barber Asphalt company, says: "European cities use for street pavement rock asphalt only. The time will come when the Kentucky natural asphalt rock deposits, if in the hands of good managers with ample capital, will supply one of the best pavements thus far used."

P. C. Brennan, M. E., Chief Engineer for the Barber Asphalt Paving Company for eighteen years, was recently quoted as follows: "I have had a large experience in all kinds of asphalt and pronounce Kentucky rock asphalt second to none."

City Engineer Thompson of Sacramento, speaking of the natural rock asphalt pavement on Capital Hill, says: "San Francisco, Sacramento and Los Angeles have miles upon miles of asphalt streets of exactly the same asphalt that is used upon Capital Hill, giving high satisfaction."

F. V. E. Bardol, City Engineer of Buffalo, under date of December 30, 1901, says: "We have fifty-two streets paved with asphalt rock from the Kentucky deposits. Some of these pavements are composed entirely of American rock, while others contain a small proportion of German rock. These pavements have been down from six to twelve years. The asphalt rock pavements have given excellent service under all conditions, proving entirely satisfactory to the city officials, the property-owners, the street users and

all concerned. The wear has been almost imperceptible and the repair expense so slight as to be scarcely worth counting. Of course, the replacing, where cuts were made for pipes or openings for sewers, has caused some expense. The pavements remain to the present time in excellent condition. Regarding the difference between those pavements wherein German rock was mixed and those where Kentucky rock alone was used, it is very slight. The durability seems to be in both all that could be desired. The lime of the German rock causes a more glossy surface, giving less grit or grip to the shoes of horses and causes more noise in stepping than is found in pavements where asphalt sandstone along was used. In conclusion I would say without hesitation that the Kentucky asphalt rock, prepared to a uniform and right consistency, properly laid on a good foundation, gives entire satisfaction and possesses all the excellent qualities of an ideal pavement."

Mr. Bardol's report for 1901 shows fifty-one rock asphalt streets laid between 1891 and 1897 under five-year guarantees, which expired in the years from 1896 to 1902. The total number of square yards laid was 175,507. On 49,992 square yards on which the guaranties expired in 1896 and 1897 the cost for repairs in 1897 was $1.74. The total first cost of the rock asphalt streets was $529,314.29 and the total cost of repairs on these streets on which guaranties had expired since 1896 was $2,082.51. Concerning pavements laid in 1891 the report states that the cost per square yard for repairs to pavements of Kentucky rock asphalt was 2.31 cents, and that no pavement was condemned, while for streets of Trinidad asphalt the cost for repairs was 14.59 cents and 111,000 square yards were condemned. The comparison shows that Kentucky rock asphalt streets, under like conditions, for the same time, cost only one-seventh as much per square yard for maintenance.

Columbus, Louisville, Indianapolis and other cities have numerous streets paved with Kentucky asphalt rock from seven to fourteen years old, and without exception all of these pavements are today in excellent condition.

The Federal Asphalt Company has been fortunate in securing Mr. Brainard Rorison, so long and favorably known as one of the most successful representatives of the Barber Asphalt Paving Company, as its vice-president and the manager of its contracting department. This indicates that the company proposes to put the management of the most important part of its business in the hands of thoroughly competent men as well as to supply ample capital for its operations. As to the latter, Messrs. Forgan, Spoor, Cummings and Webster, officers and directors of the First National Bank of Chicago, have taken a large interest in this company and are represented in its directory and active in its management.

Mr. Rorison is by birth a New Yorker, was reared and educated in Michigan, and spent twenty years of his life in Indianapolis. In that city he organized and developed the Jenney Electric Company, which was finally sold very advantageously to the General Electric Company. Mr. Rorison then became the secretary of the Ft. Wayne Electric Company and the president of the Louisiana Electric Company of New Orleans, with the largest lighting plant then in existence. Mr. Rorison, and his family as well, are devoted to travel and have resided for a year or more in each of the cities of Ft. Wayne, Detroit, New Orleans, San Francisco, London, Paris and New York. On a trip to England he became acquainted with General Greene, then the president of the Barber Asphalt Paving Company, who, after inquiring among his former business associates, engaged his services to represent the Barber Company's interests in the West. He laid many pavements for the company in Detroit, New Orleans, St. Louis and other cities of the Mississippi valley, having a record surpassed by but one of his associates. He retired from this company about the time of the formation of the asphalt trust and the retirement of Mr. Barber and Gen. Greene from the company bearing the former's name. Mr. Rorison then went to New York as the president of the Development Company of America, which has become a marked success. He was obliged to relinquish this on account of his health and made a trip to Alaska, from which he has recently returned. The merits of Kentucky rock asphalt were recognized by Mr. Rorison long ago, as they had been by men high in the counsels of the paving company with which he was connected. He was attracted by the great possibilities of the material, and with the addition of ample capital to its efficient management he became associated with the Federal Asphalt Company as a stockholder and an executive officer.

Large State Appropriations for Improvements Proposed in New York.

A bill is proposed providing for the bonding of the state of New York for $132,000,000 for "internal improvement," with the understanding that $82,000,000 is to be spent for the canals; $25,000,000 for good roads; $25,000,000 for improvements to water supply and for water storage. The good roads advocates hope in this way to obtain support of various counties like

Albany, Oneida, Onondaga and counties along the Adirondacks, where the State Flood Commission is working. The proposal would not relieve the counties from their one-half share of the expense under the Higbie-Armstrong act, but would contribute practically $25,000,000 more, making the total expenditure for good roads $50,000,000, as at first proposed.

Change in Asphalt Specifications for Washington, D. C.

Mr. A. W. Dow, the inspector of asphalt for the City of Washington, D. C., reported recently that "it is to be regretted that Trinidad asphalt is so badly acted on by water, and it is no exaggeration to say that seven-tenths of repairs that have to be made to Trinidad pavements are made necessary by the destruction of this asphalt by moisture."

This agrees with the opinion of the city engineer of Buffalo, viz: "We consider water injurious to asphalt pavement when used in large quantities. The damage from water is due to the preponderance of organic matter in the mixture originally, which, as the petroleum oil evaporates, leaves the whole material absorbent." Mr. Dow attributes the deterioration to the presence of soluble salts also. These can be removed from the asphalt by a washing process during the passage through the refinery, and thus the Trinidad asphalt, at a cost of apshall be used which contains soluble proximately $7 a ton, can be made to meet the requirement that no asphalt salts. The asphalts with bitumen percentage approximately 100 can pass this requirement without the expense of the additional treatment and some kinds of asphalt rock are also of proper constitution in this regard.

The effect of water on Trinidad asphalt pavements in Columbus, O., is also shown in the review of the report of the chief engineer of that city on another page in this number.

Outlook for Public Work in the Northwest.

The outlook for cement work in St. Paul, Seattle, Tacoma and Portland this year is very good, according to a correspondent, who says that an immense area of cement walks will be built. Everett, Wash., he says, is a new town, and the plank walks that have been constructed are too new to replace now to any considerable extent. The city has a population of about 20,000 and is growing so rapidly that it is almost impossible to raise money to do the necessary street work as fast as it is needed. The city does a large amount of grading, building street railways, telephone and electric lines, and has water works, sewers, etc., to which additions are constantly being made. It has a great many planked streets, but no permanent pavement as yet, although about ten blocks of asphalt paving is contemplated this year, and much more as fast as the city can do it.

WATER AND FIRE.

Charter Refused—Harrisburg and West Bay City Plants—Bay City—Meters Knoxville Fire Department—Brooklyn Fire Protection—Columbus Meters.

Water Works of Harrisburg Are Profitable.

The fifteenth annual report of the water and lighting department at Harrisburg, Pa., shows that the total registered pumpage each day for the year ending Dec. 31, 1902, was 3,676,122,800 gallons, and deducting 10 per cent. for slip, on account of the pump pistons being cut by the sand and culm, would leave an aggregate 3,308,510,520 gallons. This is a net increase of 425,456,250 gallons over the total of 1901, when no allowance for slip was made in the total pumpage of 3,200,060,300 gallons. The daily average allowing for slip was 9,064,414, a per capita of 151 gallons. This includes eighty gallons a day for domestic purposes and the rest for various manufacturing and other business uses.

The total earnings of the water department as set out in a supplement to the report, were $171,131.17; the total expenses, $41,251.90; interest on bonded debt, $29,720; net cash earnings, $54,656.65. The net bonded indebtedness of the department, January, 1903, was $522,601.48. The supplement concludes with an elaborate statistical array in which are given a list of places where water is furnished free; statement of receipts and expenditures by the month; cost of maintenance of pumping station, street mains, office expenses, reservoir park expenses, etc.

Water Company Refused Charter With Inadequate Capital.

A charter was refused the Canadensis Water Company recently by Governor Pennypacker on the ground that the capital stock of $1,000 is not large enough to carry out the work they propose to perform. Governor Pennypacker said:

The subscribers to the stock are three, the smallest number allowed by the statute. The amount of the capital stock is $1,000, and of this amount $100 has been paid in cash to the treasurer. It is manifest that the cash which has been paid into the treasury and the whole amount of the capital stock, if all of it had been paid, would be entirely inadequate for the purpose of the corporation.

A charter ought not to be granted where it is manifest that corporation would not be able to perform its functions. It is entirely probable that it is the purpose of the corporations, after the charter shall have been granted, to reconstruct it upon some other and larger basis, but there seems to be no reason why, if such be the purpose, it should not be manifested in the application which has ben made. For these reasons the charter is not approved.

West Bay City Council Wants to Control Water Works.

The city council of West Bay City, Mich. adopted a resolution February 16, directing the city attorney to prepare an amendment to the city charter abolishing the water commission, and urging the member of the state legislature from that district to use all honorable means to cause such an amendment to be passed by the state legislature. It was argued that the affairs of the water plant might be handled by a committee of the council, and just as good results realized as when looked after by the commission, the members of which are each entitled to receive $50 per year for their services. Mayor Walsh favors the conduct of the system by a body separated from the council.

Knoxville Fire Chief Recommends Many Department Improvements.

The annual report of the heads of the city departments of Knoxville, Tenn., were made recently to the board of public works. Chief Boyd of the fire department recommends a larger and better fire department; the purchase of a larger and more powerful fire engine at the Commerce-ave. station; from 5,000 to 7,000 feet of first-class hose; a new fire engine in East Knoxville; one new station and enlargement of another; purchase of two combination wagons and a chemical tank.

Meters in Bay City.

The annual report of Superintendent Dunbar of Bay City, Mich., shows that during the last five years the water works department has installed about 60 water meters per annum. The total number of meters in use Dec. 31, 1902, was 938. The water board intends to keep on at the present rate of installation. In all new work meters are installed at once.

Brooklyn Fire Protection Unsatisfactory.

The request of the committee of Brooklyn merchants, which is inquiring into the cause of the high insurance rates in that borough, was complied with recently by Deputy Commissioner Van Iderstine of the department of water supply, gas and electricity, who made a statement on the local water situation. He says that while the water situation in Brooklyn is better now than it has been at any time within the last five years, the supply is not adequate and that in many districts the pressure is unsatisfactory. The need of the hour is the replacing of many miles of old mains and the erection of a large number of additional hydrants.

Progress in Metering and in Leakage Survey in Columbus.

The thirty-second annual report of the water works department of Columbus, O., was submitted by Jerry O'Shaughnessy, superintendent of the department, February 14. In referring to the recently installed meter system which has proved very successful he said that this system, with proper filtration, practically solves the water supply system in Columbus for at least five years. Attention is called to his efforts during the year to locate the leaks in the water system and the making of a leak survey, and he recommends that this method be followed in the future. He recommends the laying of pipe, advised in the report of Samuel M. Gray, for the northern part of the city as soon as possible. The estimated cost of this work is $66,850. He also recommends the laying of at least a portion of the line advised by Mr. Gray to reinforce the southern section of the city. This line will be 7,500 feet long, of 36 in. pipe and will cost $68,400.

CEMENT AND LIME.

Portland Cement and Lime—Sand Brick—Michigan Production.

Mixture of Lime with Portland Cement

An article by Mr. F. P. Van Hook, entitled "Portland Cement for Wall Plaster," which will be found in vol. xxi, p. 386, of Municipal Engineering, gave the methods of using Portland cement and lime in wall plaster.

Booth, Garrett & Blair of Philadelphia have recently made some experiments which show the value of this mixture, not only for wall plaster, but for many other uses of cement mortar. The experiments were made with Nazareth Portland cement, a rock cement from Pennsylvania, and with limoid, which is hydrated Cedar Hollow lime, containing about 64 per cent. of lime hydrate and 32 per cent. of magnesium oxide. It is one of the hydrated limes which are now put on the market ready for mixing with sand to form mortar. The result would undoubtedly be similar for any other lime which is properly prepared and which does not have an excess of water to act upon the cement before it can take its proper place in the mortar. The mixture can be compared with natural hydraulic cement for many uses and with the various wall plasters made from gypsum and under most conditions the comparison will be very favorable to the Portland cement and lime mixture both in strength of mortar and in ease and therefore economy of working.

The results of the experiments referred to are given in the accompanying table.

The first four columns reading from left to right were made from samples of cement and limoid mixed by hand in proportions varying from 1½ of limoid with 1 of Nazareth, to ½ of limoid with 1 of Nazareth by weight. The fifth column shows results of a one to one mixture with the limoid and Nazareth cement ground for one hour in a ball mill before mixing with sand and water. The main object in this was to get as nearly as possible a uniform and thoroughly mixed product.

At the bottom of this table will also be noted seven days' test on the same sample of cement which was used in this mixture, using one part of cement to two parts of sand. This proportion of sand was taken in order to compare exactly with the one part of mixture to two parts of sand by weight used in all these tests, and this basis of mixture was also used that direct comparison could be made with Rosendale or natural hydraulic cements, which are generally tested with two parts of sand.

On the seven days' test it is quite uniformly shown that as the percentage of limoid increased the strength decreased, which is a natural result as the strength of lime is naturally much less than that of Portland cement. This proportional increase is also shown on the twenty-eight day test of all the samples mixed by hand, but on the three months' test a change is noted, as the mixture containing the smallest percentage of limoid did not do so well as the three-fourths of one part of limoid to one of cement. It is further noted that the increase in strength between the twenty-eight day test and the three months' test is comparatively small, showing that the material had practically reached its full strength in twenty-eight days.

TESTS ON MIXTURES OF NAZARETH PORTLAND CEMENT AND LIMOID.

These tests one part mixture, two parts sand, to make direct comparison with standard Rosendale Cement tests.

	1½ limoid, 1 part cement.	1¾ limoid, 1 part cement.	¾ limoid, 1 part cement.	½ limoid, 1 part cement.	1 part limoid, 1 part cement. (Special.)
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
7 days	74	94	92	122	124
	84	110	122	140	145
	88	98	140	168	140
	70	100	146	102	148
	92	106	98	116	132
Av.....	81	101	119	129	137
28 days	144	128	178	172	158
	128	160	160	180	174
	138	140	156	182	182
	130	146	180	194	170
	128	154	192	186	162
Av.....	134	144	173	179	169
3 mos.	148	130	194	174	180
	168	172	235	.....	166
	140	160	246	188	174
	128	184	214	190	174
	155	124	194	170	170
Av.....	148	154	217	181	174

Special—Limoid and cement were ground together for one hour in a ball mill.

TESTS ON NAZARETH CEMENT ALONE.

The same sample as used in above mixture tests.

7 days, 1 part cement, 2 sand: 340, 345, 360, 354, 336.....Average, 347

In the case of the one part of limoid to one of cement mixed by grinding for an hour in a ball mill, it is noted that it has attained far greater strength in the first seven days than the corresponding hand-mixed samples. On the 28-day test, however, the advantage is comparatively small over the hand-mixed samples, and in three months it cannot be stated that it has any advantage, with the exception of the greater uniformity in the results of the several briquettes. In other words, the variation between maximum and minimum in the special sample is far less than in those which were hand-mixed.

In the sample containing 1½ parts of limoid to one part of Nazareth cement it is noted by calculation that the cement only formed about thirteen per cent. of the total dry mixture, as 2½ parts of the mixture were used with five parts of sand. In this same sample the limoid formed twenty per cent. of the total dry mixture. Going to the other extreme, where the proportions were ½ part of limoid to one of cement, it is calculated that the cement formed twenty-two per cent. of the total dry mixture with sand, whereas the limoid formed only eleven per cent. The difference in the three months' test between these mixtures, 148 pounds in the first case and 181 pounds in the last case, or 33 pounds, shows the percentage increase in strength in the case of the sample richer in cement to be only 23 per cent., whereas the additional per cent. of cement is about 70 per cent., showing that considerable strength is given to the mixture through its proportion of hydrated lime, or, in other words, that the hydrated lime does not merely act as a filler but has strong adhesive properties in addition.

There are, of course, many other desirable features to be found in this mixture, among which might be named the following: As a Hard Wall Plaster the mixture has the property of not setting so quickly under the trowel, which in the case of the gypsum products causes considerable trouble, particularly in warm weather; it contains a large proportion of Portland cement, which has the best record for ultimate strength and durability. The mixture can be incorporated, of course, in its dry condition, with both sand and hair and be mixed ready for immediate use, the same as the present gypsum products. As a material to be used in the place of natural hydraulic cement, it has value to the builder, namely, that the presence of lime enables a brick-layer or mason to spread the mortar better than can be done with natural cement mortar, with an increased amount of work resulting from each man's services, ranging from 50 to 80 per cent. in many cases where it has been tried. The Portland cement and hydrated lime are slightly more expensive materials, but the saving in labor may greatly exceed the additional cost of material in comparison with natural cement. This is a point any builder can test for himself, and in the cases where the above results were obtained, the cement and hydrated lime were mixed on the jobs by hand and all of such labor was charged against the general result. By the use of mixing machines a further saving can be made by the contractor.

It should be pointed out that uncombined or free moisture in hydrated lime means not only a loss to the purchaser of the preparation containing it, but makes the hydrated lime unsafe when it is mixed with cement in a dry condition prior to making up the mortar. Cement immediately takes up the uncombined moisture in hydrated lime, and the amount of cement so acted upon is destroyed, so far as strength is concerned. As practically 1 per cent. of water will usually set 5 per cent. of cement in such a mixture, it is shown that from 3 to 6 per cent. of excess moisture in a hydrated lime would be dangerous within the limits shown by the above tests. It is evident from this that the percentage of water used in hydration must be carefully proportioned for each lime and worked continuously within narrow limits.

Sand Brick.

Several processes of making brick from sand have been developed and patented in Germany. A patent for one of these has been issued in the United States and will be found noted in "Recent Inventions" in the Machinery and Trade department of this number of Municipal Engineering.

A description of the Huennekes process was sent to this country some time ago by Consul Baehr of Magdeburg, Germany, and Rock Products states that a factory has been in operation in Wilmington, N. C., since June, 1902. There are several other plants which have recently been put in operation or are under construction. A brief abstract of the description of the process follows:

The factory consists of a power house and structure containing machinery for pressing and hardening brick. In the process of manufacture the sand is taken from the ground and mechanically mixed with a small amount of lime, usually ranging from 4 to 5 per cent., the lime being measured out automatically. After mixing, water is added in sufficient quantities to enable the mass to be pressed in the form of bricks, and the whole mass is then conveyed to a press which re-

sembles in its operation an ordinary clay brick press, but built for more pressure and to prevent sand from getting into the working parts. The bricks are hard enough when they come from the press to be stacked on small iron cars, each car containing usually 1,000 bricks. An entire train of these cars, as a rule there being twenty of them, is run into the hardening cylinder, a steel drum, fitted with rails and necessary appliances. The cylinder is hermetically sealed and steam is turned on under a pressure of 120 lbs. to the square inch. The mixing of the sand and lime, manipulation of the steam and other incidental operations are of the greatest importance as to the quality and hardness of the brick. The bricks remain under this treatment from six to twelve hours, then the head of the hardening cylinder is removed and the train of cars is run out. The bricks are immediately available for building purposes. The whole operation of making and hardening these bricks consumes not more than twenty-four hours, and a factory of the above description and size will turn out from 18,000 to 20,000 bricks a day of ten hours.

The quality of the brick and the cost of manufacture are dependent on the quality of sand and lime used and the equipment and skill in operating. The cost often does not exceed $3.00 a thousand. In color the brick is a whitish gray, resembling light granite, but any desired color may be acquired by adding coloring matter to the mixture. Also various shapes and sizes can be made by substituting the necessary molds in the press. The bricks are artificial stone and should stand up as well as stone. They improve with age and exposure to the air. The bricks have been subjected to numerous tests by the German government, which they report employs them in large quantities. The Pittsburg Testing Laboratory, Limited, Pittsburg, Pa., reports the crushing strength of three samples to be, respectively, 3,518, 4,162, and 3,859 pounds per square inch; the absorption after 45 hours in water, 11.6, 8.57 and 11.3 per cent.; the absorption after freezing of the first two samples, 12.4 and 8.8, respectively; and the crushing strength after freezing at 4,137 and 5,202 pounds per square inch.

Another German sand brick, Quartzitol, is reported upon by Consul Diederich of Bremen. It is made of sand and some chemical whose nature is not stated, except that it is not clay, lime, cement or calcined plaster. The process is not described and only general statements regarding the qualities of the brick are made. These are, however, very enthusiastic.

Cement Production in Michigan.

The Michigan Bureau of Labor reports that of 16 factories for the manufacture of Portland cement built or in process of construction, 10 were in operation in 1901, the output being 1,570,000 barrels. The factories employed 897 workmen, of whom 700 were laborers at an average wage of $1.60 a day. Engineers and assistants earned $2.60; machinists, $2.42; millwrights, $2.53; and foremen, $2.60.

MUNICIPAL AND TECHNICAL LITERATURE

New Publications—Municipal and State Reports.

New Publications.

Brown's Directory of American Gas Companies. Gas Statistics. Compiled and corrected by E. C. Brown. 227 pp. cloth $5. Progressive Age, New York.

This is the latest edition of this standard manual of the gas manufacturing companies of the United States and Canada. It gives full statistics concerning the operations of the various plants, including such items as capital stock, bonds, when due, and interest, names of officers, process of manufacture, population supplied, number of meters, miles of mains, prices of gas for light and fuel, product, candle power, pressure, etc., and similar data for electrical departments where operated by gas companies. Similar data are given for natural gas companies and plants for furnishing acetylene gas to towns. There is a list of parent or operating companies with names of officers. The organizations and memberships of the various gas associations of the country are given in full.

The directory is followed by a number of pages giving data and discussions of measurements of high temperatures, gas fitters' rules, natural gas for fuel, and tables for conversion of kilowatts to

horse power, and lighting schedules. A full list of books for gas men closes the volume.

Its annual revision makes the book continuously of high value to all interested in the information it gives.

Electrical Engineer's Pocket-Book, a hand-book of useful data for electricians and electrical engineers. By Horatio A. Foster, M. A. I. E. E., etc., with the collaboration of eminent specialists. Second edition, corrected. 987 pp., full leather, pocket book size, illustrated, $5. D. Van Nostrand Company, New York.

The attempt is made in this pocket-book to include the information needed by an engineer in designing all parts of an electric installation. A rapid inspection of the book indicates that the author has been very successful and the list of contributors who have revised the various sections gives confidence that the quality is commensurate with the quantity.

The table of contents does not give a very adequate idea of the scope of the book. Thus, the mechanical section contains over 180 pages, covering power station construction from materials and excavation for foundation up, boilers, chimneys, fuel, steam, water, pumps, injectors, water and steam power, and transmission details, etc. One slip in this department is the statement that a barrel of English cement weighs 400 to 430 pounds per cubic foot. When the obvious error is corrected the statement is still somewhat inaccurate.

Other sections are devoted to symbols, units, instruments, resistance, electromagnets, conductors, dynamos, lighting, railways, batteries, telegraphy and other applications of electric currents, applications of electricity in mining, the army and navy, code rules, etc., etc. Tables and descriptions are more than usually full and the electrical engineer and student will find their needs well supplied The authorities from which special tables and specific statements are taken are stated and the errors incident to the publication of this sort of books are thoroughly worked out in this second edition, so that very few, if any, of them remain.

Other smaller books devoted to portions of the electrical field have been reviewed in Municipal Engineering. This book is intended to cover the entire field, and succeeds well. It includes very many data of mechanical engineering of value to the electrical engineer, but omits such civil engineering data as the laying out of lines and curves. However, its data on the electrical engineers' side of the design of railway plants are much fuller than those in the pocket books for street railway engineers.

Both kinds of books are therefore needed by the designer, and this one is well nigh indispensable as a time saver and for its general convenience.

The Electrical Catechism; 533 plain answers to 533 practical questions about electrical apparatus. Compiled from the regular issues of Power. By Geo. D. Shepardson. 210 pp., cloth. $2. New York: Hill Publishing Co.

The principles of electricity and electrical apparatus are presented clearly and fully in the form of question and answer, made necessary in part by the use for much of the book of the question department of a monthly magazine.

The gaps in the magazine statement of the subject are filled in the same form. Magnets, dynamos and motors, circuits and wiring, measuring instruments and measurements, alternating currents, generators, circuits and principles, transformers, motor circuits, converters, electric light, incandescent and Nernst lamps are the subjects of the successive chapters after the first, which gives the principles of the science. A practical student of electricity and its applications says in reading the reviewer's copy that it is one of the most valuable books he has found.

Ohio Society of Surveyors and Civil Engineers, 22d annual report of proceedings. W. H. Boughton, secretary, Granville, O. 124 pp.; paper, 50 cents.

This volume contains the proceedings of the society at its meeting last January and is issued in time for the convention of 1903. Various papers discuss asphalt repairs, design of riveted connections, paving a country road, electric railways between distant terminals, a concrete foundation, improved roads and the U. S Geological Survey.

Proceedings of the Sixth Annual Convention of the Central States Water Works Association at Indianapolis Sept. 23-25, 1902. $1. Wm. Allen Veach, Secretary, Newark, O.

This certains the report of proceedings and the papers presenred at the convention. most of which were published in Municipal Engineering in October, 1902. The list of officers and members is included. The next meeting will be held in Dayton, O.

American Park and Outdoor Art Association. Vol. vi, parts 1 and 2. paper 44 and 86 pages. Charles Mulford Robinson, Secretary, Rochester, N. Y.

These publications are for free distribution to members of the association. Part 1 contains the constitution and list of members and the proceedings of the sixth annual meeting of of the association at Boston in August. The interesting reports from various affiliated organizations and the park census report occupy much of the space not devoted to the report of the business transacted. Part 2 contains the general addresses delivered at the convention on the influence and

utilization of parks and reservations, municipal art and civic improvement work, including a special paper about Harrisburg's recent achievements.

The Engineer of the Twentieth Century. Response to a toast at the 25th anniversary of the Engineers' Club of Philadelphia. By Charles F. Scott, President of the Engineers' Society of Western Pennsylvania and the American Institute of Electrical Engineers.

After a modest statement of the place which the engineer must take in the development of this century, Mr. Scott puts in a plea for co-operation of the followers of the various branches of the profession of engineering, an engineering congress, a center of engineering life and spirit. The city engineers' clubs which are becoming so numerous tend to break down the barriers of exclusiveness and jealousy, as they have representatives from all parts of the field and the time is coming for closer affiliation of state and national societies and of individuals in the various lines.

Report of the War Department, Corps of Engineers, Part 4, and Supplement. Gen. G. L. Gillespie, Chief of Engineers, U. S. A.

Among the valuable records in this volume are the specifications for the proposed highway bridge across the Potomac river at Washington; data on the consumption of water in Washington; studies of lake levels, of velocities of water at different depths in rivers and of the discharge of the St. Lawrence, Detroit and St. Clair rivers.

The Official Report of the Second Annual Convention of the Union of Canadian Municipalities; at Montreal, September 15-17, 1902. 103 pp., paper. W. D. Lighthall, Secretary and Treasurer, Westmount, Ontario.

The convention seems to have spent the best part of three days in a full and free discussion of a number of questions of interest and importance, such as cleanliness and improvement of streets and roads, telephone bill, registration expenses, home rule for cities, grade crossings, acquisition of outside property, voting of bonuses, etc. Steps were taken toward a closer union. The constitution and a list of the delegates present at the convention are included in the volume.

The Design of Simple Roof-Trusses in Wood and Steel, with an introduction to the elements of graphic statics. By Malverd A. Howe, C. E., Professor of Civil Engineering, Rose Polytechnic Institute. 139 pp. 67 figures, 3 folding plates, 17 tables. Cloth, $2. John Wiley & Sons, New York.

As Professor Howe states in his preface this book contains little which is new, but it preserves in compact shape the data needed for designing simple roof trusses, and the principles upon which the strains can be calculated by graphical methods, with their application to simple truss designs in wood and steel. The chapter on strength of materials gives the summary of our knowledge on the strength of wood and steel in all the various ways in which it must be developed in ordinary trusses and the tables at the end of the volume, taken from a steel company's hand book, give the other data needed for computing sizes of pieces for tension, compression and shear in direct or transverse or bearing stress.

After a short chapter on the general points in the design of a truss, the design of a wooden truss for given conditions is taken up in detail. An excellent feature of this chapter is the series of designs for the various joints and splices in common use where two members of wood or of wood and steel must be joined or a wooden member must be lengthened, including various bearing plates and angle blocks. A similar design for a steel roof truss is quite fully worked out in the following eight pages. The folding plates give the drawings for determining the stresses and showing the details of design of the trusses worked out in the above described chapters.

The book will be very convenient for students and for engineers who are not often called upon for this class of work and wish to save time in looking up data and methods of construction. It is not very extensive, as it is intended to cover only simple trusses and simple connections.

Municipal and State Reports.

Annual Report of the Director of Public Improvements and Chief Engineer of the City of Columbus, O., for the year ending Dec. 31, 1901. Frederick J. Immel, Director; Julian Griggs, City Engineer.

This report seems to be quite late in appearance, but it contains much valuable information which is not seriously injured by the delay in printing and shows that the city of Columbus is alive to its opportunities and that its officials are willing to impart the knowledge they have obtained for the benefit of citizens and of others interested in municipal operations.

A prominent feature of the report is a series of maps showing the various steps in the growth of the city territory, the wards, the topography of the city, the lines of paved streets, sewers, water pipe, gas and natural gas lines, street railways, telephone, telegraph and electric light conduits, the equipotential curves of the return current to the power stations of electrical railways and the location of fire cisterns.

There is not space to mention all the interesting tables, to which 120 pages of the report are devoted. Among them are two or three showing the repairs to streets which are well worth detailed study. That showing the cost of asphalt repairs gives the areas of asphalt, the area repaired and its percentage of the total area, the actual cost, the cost of superintendence, and the age of the pavement. From the summary it is seen that the true average age of the streets repaired was 11.64 years, that 8.31 per cent. of the yardage was repaired at an average cost per square yard of area actually repaired of $1.439, and per square yard of total area of pavement subject to repair of 11.97 cents, to which superintendence should be added at 5.17 cents per square yard of repairs or at 0.44 cent on total area. Another table shows for each street the amount of repair in gutters, summing up that 63 per cent. of the repairs were made in the four-foot space in the gutters and that 30 per cent. of the entire length of gutters was repaired. Still another table shows the total cost of repairs each year on each street since its guaranty expired and the average cost per square yard per year. These figures are variable and the table should be studied in full. Thus streets 8 years out of guaranty cost from 1.18 to 4.81 cents per square yard per year, one street which has been repaired each of the last five years of the eight since its guaranty expired cost 16 cents a square yard per year. The lowest cost is 0.1 cent for a street 3 years out. The highest except that mentioned above is 7.34 cents on a street 7 years out. Averages of such variable quantities are not very satisfactory, but, so far as they are of any value they show that it cost 4.25 cents a square yard per year to repair 253,231 square yards of Trinidad asphalt from 1 to 8 years out of guaranty; and 2.18 cents on 15,341 square yards of Kentucky rock asphalt 6 years out of guaranty.

Brick street repairs are not given in the same manner. The average cost of repair per square yard of repaved surface was $1.23.

Another interesting table is that regarding street sweeping. The price per 10,000 square feet is 34 cents for each sweeping. The total area swept was 1,975.43 great squares of 10,000 square feet. The total cost was $33,506.76 for machine cleaning and $6,018.21 for sprinkling, the sum of which, with some corrections and rebates, makes a total levied assessment of $54,506.61, which is $27.59 per great square for the season or for a 30-foot street 4.1 cents a foot on each side of the street, not charging intersections nor crediting the street railway's portion to the property. No account is taken of the variation in number of sweepings which is from 6 times a week on one street to once a month on a few. Most of the streets are swept once a week or once in two weeks. But few have hand patrol and still fewer are sprinkled. The actual assessments are as low as 2-3 cent on one street and as high as 51.6 cents on one street.

City Comptroller's Report of the Finances of the City of Peoria, Ill., for the fiscal year ending December 31, 1902, together with reports of the various departments. James E. Pillsbury, Comptroller.

This report is very prompt in its appearance and is doubly welcome on that account. The Comptroller's report is in great detail and well arranged to make it possible to find any information desired. Short reports from the City Treasurer and Fire Marshal follow, the latter giving in one table a detailed account of each fire, as to location, cause, loss, insurance, occupancy, etc. The report of the Commissioner of Public Works is very short, and, although he expended $79,000, reference must be made to the Comptroller's report for details. The superintendent of streets expands his report over a number of pages, giving a general statement of work done without detail of amount or any information as to cost. The same is true of the Sewer Superintendent's report and of that of the Sidewalk Inspector. The statistics in the City Engineer's report are more complete and show the condition of the entire city regarding public improvements. A valuable feature of the report is the detailed table of tests of paving brick made during the year, all being of Illinois brick. The tables of cement tests are also of much interest. About 3½ miles of brick pavement were laid, of which 3.11 miles, costing $106,148, were laid by public contract, and 6.85 miles of asphalt, of which but 0.58 miles were laid under public contract at a cost of $24,371.95.

One sewer was laid at a cost of about $11,000. Of sidewalks 13,015 lineal feet of brick and 10,832 of cement were constructed, a total of 4.05 miles.

The City Electrician reports his inspections of electrical connections, the Superintendents of Buildings and of Plumbing their inspections and permits issued and receipts for the same. The Commissioner of Health calls attention to the low mortality in the city—only 10.6 per 1,000 of population. He recommends a garbage crematory and public baths. The Police and Corrections departments, Food Inspector, Board of Examining Engineers and City Attorney also give short reports of the operation of their departments.

Report of the Commissioners of the Israel Putnam Memorial Camp Ground, for 1902. G. A. Parker, Hartford, Conn., Commissioner.

This state park was donated by the owners in 1889 to enable the state to restore and preserve the relics of a famous revolutionary camping ground and to erect memorials of it. The care of the grounds has been in charge of a commission, to one member of which we are indebted for a copy of the handsomely illustrated report of the last commission, containing a history of the ground and copies of the few documents heretofore printed regarding it. It is now proposed to enlarge and beautify the grounds to a greater extent than the present appropriations, aggregating $2,225 a year, will permit. Such state parks are not as numerous as they should be, and reports such as this should arouse interest in their establishment and proper maintenance.

Annual Report of the Street Department of Boston, Mass., for 1901. James Donovan, Superintendent of Streets.

This report, somewhat late in appearance, is arranged in the usual satisfactory manner to show the location and amount in detail of work and expenditures therefor. The summary of paving work done shows 94,000 square yards of granite block paving on concrete base, most of it with grout joints, 61,000 square yards on gravel base, three-fourths of which has gravel joints, 218,000 square yards of relaid granite block, 14,000 square yards of wooden block paving on concrete base, 80,000 square yards of asphalt laid and relaid, 80,000 square yards of new macadam pavement and 499,000 of macadam resurfacing, making the largest year's work under this division.

The report has some interesting tables on the cost of asphalt repairs, giving for each street the age, area, length, area resurfaced, cost and cost per square yard of surface. The cost per square yard varies without much reference to the age of the pavement from 1 cent to 23.8 cents a yard on streets actually repaved, averaging 6.3 cents a square yard a year for the total area, 94,014 square yards, of Trinidad asphalt laid in the years from 1881 to 1895 inclusive. Twenty streets aggregating nearly one-fifth the area required no repairs. The price paid for entire renewal was $2.50 and for surfacing patches $2 a square yard. The cost of repairing Sicilian rock asphalt streets varied from 10.1 cents to 30 cents a square yard on streets actually repaved, averaging 2.7 cents on the total area of 16,506 square yards, twelve streets with about 14,000 square yards requiring no repairs. These streets were laid in 1892 to 1895. One street, laid in 1895, was resurfaced and is not included above. The average cost per square yard of total area subject to repair in 1901 of repairing streets laid in each year since 1881 is shown as follows:

Year.	—Average Cost in Cents— Trinidad.	Sicilian.
1881	10.0	...
1883	12.7	...
1884	2.9	...
1887	8.5	...
1888	6.8	...
1889	14.2	...
1891	6.1	...
1892	3.8	2.4
1893	9.2	5.5
1894	7.9	2.0
1895	1.2	2.2

The sewer division built 25.78 miles of sewers and 580 catchbasins. The sanitary and street cleaning divisions have in charge the removal of house dirt and ashes, waste and rubbish and house offal divided into the three classes, and of street sweepings and from public waste barrels. A large map shows the plan of the present outfall sewer systems and the extensions which must be made in the near future.

The street watering division covered 400 miles of street at a cost of $164,259. the average distance covered by each cart being practically two miles.

Annual Report of the Department of Public Works of Rochester, N. Y., for 1901. Edwin A. Fisher, City Engineer.

There are so many points of interest in this report that it will be taken up in detail in a future number of this magazine when we will give some illustrations of some of the important work done during the year.

Lime and Cement Industries of New York by Heinrich Ries, Ph. D., and Chapters on the Cement Industry in New York by Edwin C. Eckel, C. E.

This is Bulletin No 44, vol. 8 of the York State Museum of which F. J. H. Merrill is the director, the state geological survey being one of the divisions in the work of this institution. The book contains nearly a thousand pages and gives an exhaustive study of the lime and cement rock deposits of the state, especially those which are now used as sources of material for making lime and cement, and for use in making paper, glass, iron, sugar, soda, carbon dioxide, chloride of lime, and many others. The principles and the various processes of making Rosendale and Portland cements are developed in considerable detail and there are many drawings of the machinery in use in making and testing cements. There is a partial list of books on the technology of cement manufacture.

The geology of the limestones and marls of New York is fully treated and the method of occurrence in each county is described. These descriptions are profusely illustrated with photographs of quarries and outcrops of limestone, marble and cement rock. The cement dis-

tricts are then taken up in detail and similarly illustrated. A list of the producers of lime and natural hydraulic cement is given, which is supplemented by a list of makers of Portland cement.

Mr. Eckel gives a chapter on the early history of cement manufacture in the state and one on the present factories for Portland cement, describing and illustrating their materials and processes. Two chapters give the results of tests of cement made by the state engineer in 1897 to 1900 and many limestone analyses. Two maps show the distribution of limestones and the locations of quarries, marl deposits and factories of lime and cement.

This is an extremely valuable publication and may well be imitated by other states having the same industries. Michigan is preparing a volume on the same subject. The rapid development of the industry is shown by the fact that, although this report is dated November, 1901, a number of changes in firms and in methods of manufacture and several additions to factories were made while the volume was in press and are not made in the text. An annual publication such as the "Directory of American Cement Industries and Hand-book for Cement Users," is necessary to keep up with the present rapid development in the cement industry.

Proceedings of the Fourth Annual Supervisors' Highway Convention of the State of New York, held at Albany January 20 and 21, 1903.

This is Bulletin No. 5 on the improvement of public highways, issued by the state engineer and surveyor, and the promptness with which it is issued will add largely to its effectiveness in spreading the gospel of road improvement. The propositions mentioned on another page for large appropriations should be promoted by the figures and discussions contained in this volume. It will have further attention from this magazine later, and we will illustrate some of the state work which is so well shown in it.

Financial Statement and Annual Reports of Rossland, B. C., Canada, for the Year Ending Dec. 31, 1902. John Stillwell Clute, Mayor.

Rossland is a city of 6,500 population which owns its water works, which have cost $112,922.98, on which the city owes $53,000. The statement is made on the approved form adopted by several municipal societies. It shows receipts of $18,202 and maintenance charges of $14,329, including $8,676 paid for sinking fund and interest. Construction cost, $8,633. The superintendent complains of excessive use of water in summer and of poor management of hydrants at fires. While the supply is ample for domestic purposes, that at high pressure for fires is limited and he recommends more high level storage.

It may be inferred that the city has a system of sanitary sewers, but no report of its extent or of new work during the year is made by the city engineer, whose expenditures for repairs and new construction, mainly of 2,150 feet of board walks, was $3,500. The fire department cost $10,607, and consists of 7 men and presumably two teams. The city was visited by a fire which consumed $68,285 of property.

Annual Reports of City Officers of Duluth, Minn., for 1901. W. B. Patton, City Engineer.

The mayor's message presents a summary of the official reports so far as their principal parts are concerned. He reports 25 miles of sidewalks built at a cost of $68,000. Board walks are unsatisfactory on account of their rapid decay and unsanitary condition and cement walks are very slippery during the long winter season. The proper material for walks has not yet been found by him. The reviewer would suggest the consideration of bituminous materials for this purpose. The streets and gutters seem to need much prompt repair. Conditions in the city are such as to make street repairs more frequently necessary than in cities located in more level country. He recommends the extension of the civil service regulations to cover as many of the city employes as possible. Public play grounds and numerous small parks are strongly recommended. A new contract for electric light is reported on the basis of $55 per lamp on all-night schedule, 6½ ampere and 70 volt lamps being used, also a number of double 16-candle-power incandescents lights at $18 for each pair. Free light is furnished the city hall and one arc light for each improved park.

The treasurer's and comptroller's reports are in detail and so collected and summarized that almost any desired information regarding the items of the city's receipts and expenditures can be readily obtained.

From the city clerk's report it is learned that a liquor license costs $1,000 and that 168 were issued. The total income from licenses was over $175,000. The assessor's report gives the city tax rate as 17.7 mills on the dollar and the total of state, county, school and city as 29.9 mills. The city attorney and clerk of municipal court give detailed statements of cases tried and their disposition. The fire and police departments make detailed reports of their operations and men.

The city engineer's report shows a large amount of work done, amounting in all to $422,205, half of which is for bridges. On streets 1.7 miles of sandstone and brick paving were laid; 2.96 miles of sewers were laid and 15.94 miles of sidewalks. A large table makes possible a compari-

son of contract prices on each item of public work for the past twelve years. Including work done by private parties 21.73 miles of plank sidewalk were built and 3.21 miles of concrete and tile walks. The excellent results obtained in the water and light department were given in this department when the report was presented to the city council last spring.

ORGANIZATIONS AND INDIVIDUALS

American Road Makers—Portland Cement Manufacturers—Technical Meetings—Personal Notes.

The Detroit Convention of the American Road Makers' Association.

The American Road Makers' convention was held on Feb. 13 and 14 at Detroit, Mich. The meetings were held in the Sun parlor of the Wayne hotel. About 75 persons were present, representing various states in which the movement for good roads has been inaugurated. The visitors were welcomed to the city by Mayor Maybury, and the response, in behalf of the road makers, was by Vice-President Edward A. Bond, state engineer of New York.

The business of the session began with the reading of the message of the president, ex-Senator Horatio S. Earle of Detroit.

Committees were appointed as follows:

National Aid Committee—Edward A. Bond, W. L. Dickinson, Maj. Dabury.

State Aid Committee—John W. Potter, Wm. P. Judson, Wm. Wayne.

State Instruction Committee—Dr. E. B. Smith, James H. McDonald.

Interstate Highways—Wm. L. Dickinson, Samuel Huston, John H. Scott.

Credentials Committee—Wm. S. Crandall, W. L. Dickinson.

Publicity Committee—A. H. Battey, Wm. S. Crandall.

Railroad Rates for Road Material—Prof. L. M. Haupt, Edward Kunz.

County System—Dr. A. W. Nichols, H. H. Eymer, H. T. Granner.

Township System—F. F. Rogers, A. J. Crosby, Robert Trombly.

State Labor System—A. W. Campbell, Wm. T. Creasey.

Convict Labor Committee—George Burns, W. A. Cook, Frank D. Lyons.

A number of resolutions pertaining to the various phases of the association's work were introduced and referred to the proper committees.

An address by William P. Judson, deputy state engineer of New York, gave interesting facts and statistics concerning the progress of road building in his state under the operations of the "good roads" law authorizing state aid to counties. He said:

Under the provision of the "good roads" law, by which state aid is given to counties, forty-three counties have asked for 401 roads, a total mileage of 2,007, of which the state engineer has surveyed 277, in forty counties, aggregating 1,159 miles. Of these there have been built or are now building by the state 115 macadam roads, located in twenty-three counties, aggregating 317 miles in length, at an average cost of $8,919 a mile; also five earth roads, located in Orange and Rensselaer counties, aggregating thirty-five miles in length and varying in cost from $2,000 to $3,000 a mile.

Surveys, plans and estimates have been made and accepted and the counties' half of the estimated cost has been appropriated by the boards of supervisors for ninety-nine macadam roads in twenty-two counties, aggregating 339 miles in length, at an average estimated cost of $8,212 a mile. Surveys, plans and estimates have been made or are now in progress for sixty-two roads, aggregating 466 miles in measured length, which will be submitted to the boards of supervisors at their coming sessions. Surveys are yet to be made for 124 roads, located in twenty-five counties, aggregating 360 miles in estimated length. For this work the state has appropriated $1,465,000 during the five years that the law has been in force.

The Hon. Martin Dodge, director of public road inquiries of Washington, D. C., addressed the meeting in support of the Brownlow bill now pending in congress. The provisions of this bill have heretofore been published in Municipal Engineering.

William H. Brooks, highway commissioner of Philadelphia, addressed the

meeting on "How to Build and Maintain Common Dirt, Gravel and Macadam Roads Within the City Limits."

The National Aid committee reported a resolution indorsing the "principles" of the Brownlow bill without specifically indorsing this bill. The discussion following the report of the committee developed the fact that the association was unanimously in favor of the general plan for national aid to state governments in road building. There was a difference of opinion as to whether such aid by the national government to any lesser political division than a state should be authorized.

The National Aid committee also reported a resolution favoring an increased appropriation for the Office of Public Road Inquiries, which was adopted.

The Interstate Highways committee reported a resolution favoring the co-operation of state and county governments in the matter of road building to insure a more general uniformity in the methods of construction and character of roads constructed.

The committee on Railroad Rates for Road Materials, in a preamble to resolutions reported, set forth the advantages to be obtained by the railroad companies in encouraging the construction of good roads. The preamble stated that in a large measure freight blockades were due to bad roads impeding the delivery of freight to the railroads in certain seasons and, in consequence thereof, thrusting unusual quantities of freight upon them at other times. The resolutions based upon this preamble suggested to railroad traffic managers "the expediency of rendering material financial aid to the states, counties and townships which may engage in the improvement of their highways, by reducing the charges or classification on all materials actually employed in the construction of roads to a merely nominal figure and in rendering such other aid and encouragement as may seem to be in the best interest of all concerned." The resolution was adopted.

The committee on State Labor system recommended that all states be encouraged to abolish the labor system for improving and repairing roads and substitute the cash system.

The committee on Convict Labor reported in favor of seeking the enactment of laws in all states providing for the employment of all prisoners under sentence in state, county and city prisons in the preparation of road materials. Under this plan the state would work the quarries, gravel pits, etc., and prepare the materials for use. It would then deliver them on board cars free of cost to the county or township, the latter merely paying the cost of transportation. The resolution was adopted with a single dissenting vote.

A resolution was also presented, the purpose of which was that counties should issue bonds for road improvements which bonds should then be exchanged for special "highway bonds" to be issued by the national government, such "highway bonds" to draw interest at the rate of one half of one per cent. per annum.

A committee was appointed to present this proposition to congress. The committee named consists of C. C. Bell of Missouri, William F. Hill of Pennsylvania and Mr. Hathaway of Alma, Mich.

It was decided to hold the next meeting at Albany, N. Y., on a date to be announced later by Vice-President Bond.

All the officers were re-elected, as follows:

President—Horatio S. Earle.

First Vice-President—Edward A. Bond.

Second Vice-President—Charles D. Willard.

Third Vice-President—J. A. Holmes.

Treasurer—Col. W. L. Dickinson.

Secretary—W. S. Crandall.

The Association of Portland Cement Manufacturers.

The Association of Portland Cement Manufacturers is made up of corporations, firms and individuals engaged in the manufacture of Portland cement, practically all of those in the eastern states. At the annual meeting December 9, 1902, which came as the outgrowth of several informal meetings during the fall, the following officers were elected: President, R. W. Lesley, Philadelphia; vice-president, John B. Lober, Philadelphia; secretary, A. F. Gerstell, Alpha, N. J.; treasurer, E. M. Young; executive committee, H. W. Maxwell, William W. Warren, W. W. Maclay, T. Henry Dumary, W. H. Harding, George E. Bartol, E. R. Ackerman. Committees were appointed upon specifications, packages, new uses for cement, export, transportation, etc. The next quarterly meeting will be held in New York City in March. A representative from the Central Cement Association is expected at that time, when a collective exhibit at the St. Louis Exposition will be discussed.

The Committee on New Uses of Cement, T. Henry Dumary chairman, has made an interesting report on the uses to which cement is now put, from which the following is taken, stating first for each item the use made of the cement; second, where employed; third, its purpose; fourth, the method of construction or use:

Protecting Steel in Buildings—Investigation by Charles L. Norton for

American Association of Insurance Inspectors as preventive against rusting neat Portland cement, even in thin layers; concrete to be effective must be dense and without void or cracks; should be mixed quite wet where applied to metal. Cinder concrete, free from voids and well rammed when wet, is about as effective as stone concrete. Steel must be clean when bedded in concrete, scraping, pickling, a sandblast and lime should be used, if necessary, to have metal clean when built into wall.

Vaulting—In Office Building of General Anson Miles, S. W. Cor. 17th and Penn.-ave., Washington, to replace usual form of construction, consisting of brick arches and iron beams. Girders are made in frames of required shape with iron rods imbedded in material.

A New Process for Dealing with Quicksand — Patented by Robert L. Harris, Am. Soc. Civ. Engineers, for forcing into quicksand a solidifying liquid whereby all solid matter is precipitated in a few minutes, leaving water clean. (a) A 2-inch or other relatively large pipe is first driven to the desired depth, and some of the material about the bottom washed out, to leave a small cavity. (b) A smaller pipe, carrying at its end suitable valves for closing pipe against any upward current when the cementing fluid comes to be injected, is then put in the larger pipe. When this inside pipe extends down below the outside one there is a free passage for fluid either up or down. When inner pipe is drawn up a little, however, all chance for the escape of the fluid upward is cut off. (c) Machinery for driving and manipulating them. (d) Box to mix grout, or other cementing fluid. (e) Pumps to produce a considerable current and moderate pressure. By producing a violent agitation in the main cavity just before the introduction of the solidifying liquid, a large amount of quicksand is put in suspension, the introduction of the foreign fluid results in an intimate mixture, and there is immediate precipitation; so there should result a floor composed of both substances in fairly uniform proportion.

Piling—To act as a substitute for timber in the piling department of building constructions. A shell of sheet iron, the shape and size of the pile required, is driven into the ground. This is accomplished by fitting the shell over a heavy steel core, which can be driven by the common type of steam hammer or driver, and will carry the shell down with it. By a simple device the core contracts so that it can be lifted out easily. The concrete is then poured into the shell, and the job is completed. One such pile will carry as heavy a load as two or three ordinary sticks; durability, endless; cost, not much larger than wooden piling, especially if there is a water-line to deal with.

The Cementing of Petroleum Wells—Employed at Baku, Russia. A riveted casing used in drilling wells. The interstices are filled with cement, to keep the water from the bore hole. Solution of cement should be made with water from the Caspian sea, strength 1,000 c. c. of cement to 122 c. c. of water; solution introduced into well through a ¾-inch pipe, length of which sometimes reaches 1,750 feet. Hardening of cement should take place within two days. Pressure of water in well sometimes reaches forty atmospheres. Delivery pipe cannot be put down too close to spot where cement is required.

Cement Butts—Employed at Battle Creek, Mich. Footing for telegraph, telephone and trolley-line poles. Butt is octagonal. Four pieces of scrap iron attached to lower ends by bolts, one being raised to permit pole to be lifted into place, base of wooden pole having been scoured on four sides to permit of good, flat contact between steel straps and pole. Pole is then bored for reception of bolts, and steel straps attached to cement butt are bolted to pole.

Cement Vault—For preventing escape of noxious gases from decomposing bodies. Made in sections of Portland cement, and dome shaped.

Cement Veneering—Employed at Pekin and Kenilworth, Illinois. Keeps houses cooler in summer and warmer in winter than those built of lumber. By hydraulic pressure can be made into any shape or design wanted.

Cement Cross Tie—To replace the usual oak cross tie in the construction of railroads. Although they cost three times as much as oak ties, it is claimed they give 25 times as much service.

Reservoir—At Florence, Col., at works of Portland Cement Company. For containing oil, water or any liquid. It is built entirely of cement and barbed wire. The sides are also strengthened by numerous coils of barbed wire.

Storage Tank—For cement for Illinois Steel Company, South Chicago, Illinois. Erected according to the Monier system.

In Salt Mines—For preventing the incursion of water into the workings.

Cement Stone Making—For producing carved panels, brackets, keys, columns, capitals, pilasters, moldings, etc., at one-third the cost of hand-carved natural stone.

Floor Blocks—Patented by Dr. Mann. Fire-proof blocks, which are delivered to the builder ready made. They consist mainly in the combination of Hollow Concrete blocks, which are slid between the flanges of the usual steel beams.

Sewer Mains—

Concrete in Combination with Expanded Metal—

Girders—Reinforced with steel rods.

The Hennebique System—Made with the best Portland cement concrete, in which are entirely imbedded ordinary round bars of iron or steel and stirrups of hoop iron. A wooden mold of whatever shape is desired, be it column, wall or floor, is then made. In this mold are placed the bars or stirrups, which are held in place by steel stays. The materials of concrete are poured in around the metal and tightly packed, and as columns, walls and floors are connected the building becomes a monolith. The mold remains in place until the material has thoroughly hardened, which usually requires about 10 days.

In Ships—In ballast tanks for preservation of steel on bottom as well as on any other part of tanks. The bottoms of the tanks are merely cement washed.

Cement Coal Bricks—Invention of Noyes Palmer. Coal yard siftings are mixed with cement in the ratio of 12 to 1.

Skyscraper—Replace usual method of building similar structures.

Grain Elevator at Duluth, Minn.—On the concrete and wire mesh system, with steel tie rods as additional strengthening, no wood being used in the building.

Cement Way—Proposed for the automobile track between New York and Chicago. It consists of two parallel wheel-supporting layers on concrete imbedded in the roadway.

Technical Meetings.

The twenty-second annual convention of the American Water Works Association will be held in Detroit, Mich., June 23 to 26.

The next convention of the National Good Roads Association will be held in St. Louis, Mo., April 27 to May 2.

The third annual convention of the American League for Civic Improvement will be held at Chautauqua, N. Y., July 13 to 18.

The Memphis Engineering Society held a meeting Feb. 10 and discussed bridges. Capt. F. B. Maltby read a paper on the bridges constructed over the Mississippi river. The subject was illustrated by stereopticon views.

The next meeting of the Engineering Association of the South will be held in Nashville March 12. The water works and electric lighting system of Tullahoma, Tenn., was described by Mr. Granberry Jackson at the meeting held Feb. 12.

The seventeenth annual meeting of the Canadian Society of Civil Engineers was held in Montreal Jan. 26, 28 and 29. Officers for the ensuing year were elected as follows: President, K. W. Blackwell, Montreal; vice-presidents, G. H. Duggan, Sydney; C. B. E. Marceau, Montreal; G. A. Mountain, Ottawa; treasurer, H. Irwin, Montreal; secretary, Prof. C. H. McLeod, Montreal; librarian, E. G. M. Cape, Montreal.

The New England Water Works Association held a meteing Feb. 11 at Boston. A paper on the water supply of New Orleans and its improvement was read by Robert Spurr Weston of Boston, and on pipes and pipe laying of the Metropolitan Water Works, by Caleb Mills Saville, division engineer of the Metropolitan water works.

The National Municipal Ownership Convention was held in New York City Feb 25, 26 and 27, under the auspices of the New York Reform Club. The program contained the following papers: "Recent History of Municipal Ownership in the United States," discussed by W. W. Howe, C. R. Woodruff and L. N. Case; "Recent British Experience in Municipal Ownership," Robert Donald; "Recent German Experience in Municipal Ownership," E. T. Heyn; "Comparison of European and American Methods and Results," R. P. Porter; "City Owning and Leasing," E. M. Shepard; "Massachusetts Experience," L. D. Branders; "Electric Lighting," W. Clark and A. D. Adams; "European Experience of Public Ownership of Telephone," A. R. Bennett; "Argument for Public Ownership of Telephones," Prof. Parsons; "The Superiority of Corporation Ownership of Telephones," U. N. Bethell; "City Ownership of Water Supply," W. R. Hill; "How Should Public Service Be Controlled," R. R. Bowker; "Regulation and Taxation of Public Service Corporations," A. R. Foote; "Taxation of Franchise Values," F. Howe. John Martin, Secretary, 50-52 Pine-st., New York City.

The nineteenth annual meeting of the Connecticut Society of Civil Engineers was held at Hartford, Conn., Feb. 10. Clarence B. Vorce, the retiring president, devoted the greater part of his address to the previous meeting of the society at Bridgeport, where the members inspected the work of track elevation. Charles M. Crawford of the Hartford Paving and Construction Company read a paper on "The Constituent Parts of Concrete."

The second meeting of the Wisconsin Gas Association was held in Milwaukee Feb. 11 and 12. Some of the papers submitted were as follows: "Ammonia Concentration for Gas Works," John S. Unger, Milwaukee; "Four Months' Experience with Gas Engines," George McMillan, La Crosse; "Central Station Gas Engines," C. H. Williams, Madison; "Two

Years' Experience in Distributing Gas Under High Pressure," George Goodnow, Waukegan; "A Few Photometric Tests of Incandescent Mantles in Commercial Use," R. C. Cornish, Racine; "Gas for Industrial Purposes," James H. Walker, Milwaukee.

A good roads convention will be held at Springfield, Ill., March 17 and 18. Col. Charles F. Millis, chairman of the committee, is corresponding with the manufacturers of road making machinery endeavoring to interest them in making an exhibit of plows, scrapers, harrows, graders, rollers, levelers, dumps, etc., during the convention.

The thirteenth annual meeting of the Ohio State Board of Health and the local boards of health of Ohio was held at Columbus Jan. 29 and 30. Some of the papers submitted were as follows: "The Fly and Mosquito as Disease Carriers," Dr. Walter Wyman, surgeon-general of public health and Marine hospital service, Washington; "Beelzebub," Dr. Josiah Hartwell, member state board of health, Canton; "Purification of Public Water Supplies," L. E. Chapin, M. Am. Soc. C. E., Canton; "Review of Laws Governing Boards of Health," Smith Bennett; "Exercise of Police Power by Boards of Health," A. G. Fuller; "Importance of Air and Sunshine in the Home," Dr. T. W. Rankin; "Neglected Opportunities of Boards of Health," Dr. C. O. Probst.

Personal Notes.

C. T. Wilson has been appointed city engineer at Waterloo, Ia.

Hon. Edward May has been elected mayor at Verdun, Quebec.

J. R. Butts has been elected president of the water board at Wheeling, W. Va.

R. E. Smith has been reappointed commissioner of public works at Providence, R. I.

Carl Binder, M. West, Soc. C. E., died at his home in Chicago Feb. 4, aged 53 years.

Hon. Charles S. Farmer has been inaugurated as mayor at New Martinsville, W. Va.

S. M. Shelley, city engineer at Ballard, Wash., has appointed G. P. James, deputy engineer.

William A. Sweet has been elected highway commissioner at North Providence, R. I.

R. P. Rader has been elected superintendent of the Lehigh Water Company, Easton, Pa.

J. W. Howard has been elected city engineer at Savannah, Ga., to succeed J. de Bruyn Kops.

Frank T. Dodge has been re-elected superintendent of the water board at Portland, Or.

William Mulholland has been re-elected superintendent of the water board at Los Angeles, Cal.

John F. Sprenkle has been elected general manager of the York Water Company, York, Pa.

James Franklin Houghton, C. E., died at his home in San Francisco, Cal., Jan. 31, aged 75 years.

Christian Friedrich, alderman for the Eighth ward, Elizabeth, N. J., died suddenly February 18.

Arthur L. Gifford has been appointed city engineer at Elgin, Ill., to succeed Adin Mann, resigned.

C. W. Murray has been appointed city engineer at Americus, Ga., succeeding J. B. Ansley, resigned.

R. C. Boekklen, the inventor of the Boekklen process of gas making, died in Brooklyn, N. Y., Feb. 1.

Edward Dillon has been elected superintendent of the New Haven Water Company, New Haven, Conn.

George A. Ralph has been appointed engineer of the ditch construction of Polk county, Crookston, Minn.

F. D. Carlisle has been reappointed superintendent of the City Water Works Company at Bowling Green, O.

O. T. Smith has been re-elected secretary and superintendent of the Freeport Water company, Freeport, Ill.

William H. Ulrich has been elected superintendent of the Fredericksburg Water Company, Fredericksburg, Pa.

L. C. Stubbins has established an office in the Demaree Building, Mattoon, Ill., and will practice civil engineering.

Charles Thorn has resigned as chief of the fire department at Port Huron, Mich., his resignation to take effect March 2.

John Wharton Maxcy, Houston, Tex., has been appointed superintendent of country roads for Harris county, Texas.

Frank B. Locke, M. Am. Soc. C. E., has been appointed city engineer at North Adams, Mass., succeeding John H. Emigh.

William A. Brady has been re-elected commissioner of public works and George A. Carpenter city engineer at Pawtucket, R. I.

R. I. D. Ashbridge has resigned his place as first assistant engineer in the municipal filtration bureau at Philadelphia, Pa.

D. W. Pike of Tuttle & Pike, civil engineers, has been appointed city engineer at Kansas City, Mo., to succeed Robert Waddell, resigned.

Col. D. E. Holmes has been elected president of the board of water works trustees at Madisonville, O., to succeed J. S. Nowathy, resigned.

Frederick R. Brownell died at his home in Little Compton Feb. 5, aged 66 years. Mr. Brownell was town clerk of that place for 20 years until 1901.

The Kelly-Springfield Roller Company, Springfield, O., has established an office at 220 Broadway, New York City, with T. E. Pixley in charge.

Brainard Rorison has been elected vice-president of the Federal Asphalt Company at Chicago, and put in charge of the construction department of the company.

Fred F. Moore has resigned as a mem-

ber of the Metropolitan Water and Sewerage Board at Boston to accept a position with the New York Commission for the investigation of additional water supplies.

Fred C. Evers has been elected president of the Wm. H. Evers Engineering Company, 634-635 Williamson Bldg., Cleveland, O., to succeed William H. Evers, resigned.

O. K. Olmstead, town engineer at Bloomfield, N. J., has been appointed assistant engineer in connection with filtration work for the commission on additional water supply at New York City.

Ernest G. Hopson has been appointed engineer in charge of surveys for the commission on additional water supply for New York. Mr. Hopson was formerly with the metropolitan water board at Clinton, Mass.

Mr. Adam Thompson, who was with the Indianapolis branch of the Western Paving and Supply Company for several years, is now at the head of the sales department of the Central Asphalt and Refining Company, headquarters at Chicago.

Mr. Seymour Nelson of Swain, Nelson & Sons, landscape gardeners, Chicago, visited Cedar Rapids, Ia., in February to present preliminary plans for Ellis park and for a public playground. His firm has the contract for laying out and designing the park.

John P. Cranford, formerly a contractor of Brooklyn, N. Y., died February 5 at his home in Wakefield, N. J., aged 59 years. Mr. Cranford laid asphalt pavements in New York City, Brooklyn, Boston, Washington and San Francisco thirty years ago.

Clinton K. Rossiter has been appointed by Mayor Low a member of the Atlantic Improvement Commission, which has under supervision the sinking of the tracks of the Long Island R. R. Mr. Rossiter was formerly president of the Brooklyn Transit company.

City engineers have been elected as follows: Ezra Barkhuff, Tacoma, Wash.; W. B. Howe, re-elected, Concord, N. H.; Bertram Brewer, Waltham, Mass.; William F. Keene, Central Falls, R. I.; C. B. Cooke, Wheeling, W. Va.; J. Carr Thayer, Middletown, N. Y.

George F. Chase has resigned as clerk and superintendent to the board of water commissioners at Taunton, Mass., to accept the position as superintendent of water works of the Framingham Water Works Company at South Framingham, succeeding Alfred E. Martin.

John M. Farley, M. Am. Soc. C. E., has established offices in the Barnum building, White Plains, N. Y., where he will engage in municipal engineering work, including water supply, sewerage, sewage disposal and railway location and construction.

Mr. George H. Gibson has resigned his position with the Westinghouse Companies' Publishing Department of Pittsburg Pa., to accept a position with the B. F. Sturtevant Company of Jamaica Plain Station, Boston, Mass., the well-known manufacturers of blowers, heating, ventilating and forced-draft apparatus, electrical machinery and steam engines. Mr. Gibson was formerly a member of the editorial staff of the Engineering News of New York City and is a graduate of the Engineering School of the University of Michigan.

The Chicago office of the National Bitumen Company is in charge of A. W. Haffter. His brother, N. A. Haffter, is his assistant. In a conversation with a representative of Municipal Engineering on February 6 Mr. W. A. Haffter said they had received inquiries concerning their bitumen from all parts of the country and each mail was bringing additional inquiries. He attributed this to their advertisement in Municipal Engineering which appeared for the first time in the February number, issued just six days prior to the date of the conversation.

MACHINERY AND TRADE

Anonymous Attacks on Warren's Bitulithic Pavement.

While our February number was on the press the letter below was received from Warren Brothers Company and the first opportunity is taken to present the matter to the readers of Municipal Engineering. We do not believe that the anonymous attacks of which the letter speaks would have an appreciable effect upon any of them, from the very fact that the lack of authority for them shows the slight confidence which the detractors of the pavement have in the value of the points they try to make, and our readers are too well informed upon the points of merit and the defects in all classes of pavement to be misled by them.

We present the letter, not because the warning is needed by our readers, but for such use as any of them who are interested in fair play may make of it with others. It is as follows:

The asphalt trust, true to its rule or ruin policy, has had its literary bureau busy for the past several months in writing and circulating, always anonymously, volumes of malicious attacks on the "Bitulithic Pavement," otherwise known as "Warren's Patent Bituminous Maccadam Waterproof Pavement," for the very reason that this pavement has met with the approval of taxpayers and practical engineers to such an extent that during the past year it has been adopted and contracted for in forty-four American cities to the extent of over 800,000 square yards, is today in the lead in a large number of other cities, and is, therefore, a serious menace to the existence of the trust.

The anonymous circulars are not only full of misstatements of fact, but attribute to members of this company statements which they never made, and misrepresent by quoting detached sentences and clauses, carefully omitting the context, thereby giving an entirely different expression and meaning to the detached sections.

In answer to such anonymous attacks we prefer to refer for vindication of us and our pavement (if any vindication is necessary) to the thousands of practical disinterested citizens and officials throughout the country, who have used and carefully examined the pavement. If anyone from these classes has condemned our pavement or stated that it is built on impractical, unsound or unscientific principles we have not heard from him.

Even the asphalt trust, in its circulars, does not make any such claim, but seeks to prejudice and poison the public mind by attacks which are not based on facts and cannot be substantiated on any technical or scentific grounds.

Warren Brothers Company is composed of a large organization of practical men, who have grown up with and devoted their entire business lives to the development of the bituminous pavements industry, having held positions of importance in the practical departments of the Warren-Scharf Asphalt Paving Company and the Barber Asphalt Paving Company and other kindred organizations now merged in the National Asphalt Company, otherwise known as the Trust. The members of Warren Brothers Company have had direct charge of the laying of over one-third of the asphalt pavements of the United States and Canada. They appreciated the weakness of the old asphalt pavement and "The Bitulithic Pavement" is the result of their combined energy and scientific study. It is not an experiment, but a development in the industry and not only provides scientifically accurate means to give uniformly the results which were attained occasionally by haphazard methods in the laying of pavements thirty years old and still in good condition, but in many details improves on them.

To men acquainted with the business it is a well-known fact that the trust, while doing business in the name of the old organization which built up the industry is now managed by men, very few of whom have had any considerable practical experience in the bituminous or asphalt industry, nearly all of the financial and practical managers of the business having withdrawn therefrom.

The United States government has recognized the novelty of our improvement by granting us five independent patents.

The Asphalt Trust by all sorts of anonymous subterfuges seeks first to

make the public believe the Bituminous Macadam pavement is practically worthless and experimental, and, failing in that, seeks to be allowed to lay something "just as good," and to hoodwink the public into letting it use its inferior and cheap Trinidad Lake asphalt in the construction.

In spite of these attacks and the methods taken by the once powerful trust, we propose to keep right on in the development and introduction of our bitulithic pavement, trusting that by fair dealing with the public it will not permit us and the pavement to be slaughtered by turning it over to its enemies and that it will see through the unwarranted attacks which are being made so strenuously, but anonymously, and insist in the future as in the past, that if the bituminous macadam or bitulithic pavement is to be laid at all the work shall be done by the people whose entire interests are involved in making a success of the construction.

WARREN BROTHERS' COMPANY,
By F. J. Warren, President.

Kreodone Wood Block Pavements.

If the creosoted wood block pavement possesses the element of durability to a degree sufficient to warrant its continued use on the most heavily trafficked streets of London and is sufficiently smooth and noiseless to warrant its use on the magnificent boulevards of Paris, is it not such pavement as would be eminently suitable for use on both the business and residence thoroughfares of American cities?

The wise engineer is he who benefits by the experience of others. That pavement which has been tried and found serviceable and well adapted to the varying conditions which exist in every large city should commend itself somewhat strongly to those who are studying the paving problem. The city engineers and others who have in European cities devoted years to the making of experiments and tests of a thoroughly practical as well as scientific character have conclusively decided that the creosoted wood block pavement possesses a number of peculiar and especial merits which place it in a class by itself. Many of the boulevards of Paris, universally conceded to be the finest in the world, are paved with creosoted blocks. This form of pavement has stood the test of time as to durability and its noiselessness, smoothness, cleanliness and beauty have made it especially popular as a boulevard pavement.

In London some of the most heavily trafficked streets in the world are paved with creosoted blocks.

In America there are but few streets over which pass as many as 12,000 vehicles a day. M. Barabant, late Chief Engineer of Paris, has reported that, by actual count, the number of vehicles which daily pass over the Rue de Rivoli and the Rue Auber, both of which are paved with creosoted wood blocks, is respectively 42,035 and 14,032. His report also shows that in London 26,793 vehicles daily pass over King William street, 16,531 over Queen Victoria street, and 12,158 over Holborn—all of which streets are paved with creosoted blocks.

The Kreodone wood block pavement, which during the past few years has been laid in several American cities, is a distinct improvement over the creosoted pavement, as the Kreodone is a very material improvement over what is commonly known as creosote oil. This result was brought about at the instance of the Republic Chemical and Creosoting Company of Indianapolis, which employed for the purpose several scientists of high reputation who conducted a long and elaborate series of experiments before attaining the desired results.

Being a product of tar, creosote oil has always varied materially in quality with the quality of the coal from which the tar has been extracted. To this lack of uniformity in quality must be added the serious defect of volatility, which manifests itself to a greater or less extent within a few months after the pavement has been laid. The result is a gradually increasing porous condition of the blocks, the absorbing of moisture and an ultimate bulging of the pavement.

Kreodone, on the contrary, it is claimed, is uniform in quality and non-volatile.

A wood block which has been properly and thoroughly impregnated with Kreodone should retain it indefinitely.

In the laying of a Kreodone pavement only a high quality of wood should be used. Yellow pine is perhaps to be preferred, although tests of crushing strength, and of toughness, made by U. S. government experts, demonstrate that Tamarack, Beech, Elm and Red and Yellow Fir are approximately equal to the best quality of Yellow Pine. These woods would therefore very naturally be used, and it would be economy to use them, where they are cheaper than the Yellow Pine.

The blocks, which are rectangular in shape, should be carefully culled, and the street inspector should permit none to be laid which are defective in any particular. Large knots are especially to be guarded against.

Laid on a secure foundation—preferably cement concrete—a Kreodone pavement on a residence street should have the life of granite and on a business street where

KREODONE PAVEMENT ON WASHINGTON BOULEVARD, ST. LOUIS. FINISHED PAVEMENT.

KREODONE PAVEMENT ON WASHINGTON BOULEVARD, ST. LOUIS. LAYING BLOCKS.

the traffic is such as is found on the average thoroughfare of our large cities, one of many years.

A Vitrified Pipe Water Conduit.

The use of clay pipe for sewers needs no recommendation but its substitution for iron pipe for water mains is an innovation. There is no reason why the vitrified clay pipe should not give as good service in the one case as in the other.

The city of Hartford, Conn., has set an example to other cities in this line by laying a twenty-four inch water main of double strength vitrified clay pipe which carries water between the Hartford and West Hartford reservoirs. Before the introduction of this conduit line, the water flowed along a canal by the side of a road. This method of transporting the water was open to serious objections on account of the danger of pollution, but the length and size of the pipe necessary to take the place of the canal, placed the laying of an iron or steel conduit out of the question. The problem was solved however, in a most satisfactory way by the American Sewer Pipe Co. of Pittsburg, Pa., which put in the twenty-four inch main referred to above. The line is 16,000 feet in length and is capable of carrying more water than was calculated for by the engineer. The crushing power which the pipe can withstand may be judged from a test of a thirty-inch pipe, which withstood a lateral pressure of 27,875 pounds.

An illustrated description of the line and of the methods of laying pipe will be found in Municipal Engineering, Vol. xx, p. 89.

The Central Asphalt and Refining Company.

The Central Asphalt and Refining Company was organized under the laws of Texas and incorporated in 1901 with a capital of $2,000,000, for the purpose of producing asphalt in its various forms and by-products from oils. A plant is now in operation at Port Neches, midway between Beaumont and Port Arthur, Tex., near the head of Lake Sabine, which, as soon as the necessary "tightening up" has been completed, will turn out from 2,000 to 5,000 barrels per day of asphaltum and distillates.

Gen. S. T. Carnes of Memphis, Tenn., is president of the company and Mr. Martin Howard of Chicago is vice-president and general manager. F. W. Short, secretary and J. A. Fullenwider, assistant treasurer. The main offices are located in the Columbus Building at 189 La Salle st., Chicago, and all business of the company is conducted from this office. The local offices are at Port Neches, Tex.

Mr. Howard, in a conversation with a representative of Municipal Engineering, said: "The product of the company is genuine asphaltum not excelled, and for roofing purposes guaranteed not to run in any sun heat nor to become brittle in any freezing weather. It is over 99 per cent. pure asphaltum. The paving asphalt produced is of the same high standard of purity. Purity in all products is our aim and all of our asphaltic products, paints, insulations, etc., will bear out our fullest claims for them."

The distillates produced by the company are gas, lubricating and burning oils.

Chemical analysis of the asphalt manufactured by the company made by J. Dunraven Young of Chicago shows the following:

Total Bitumen	99.16 per cent.
Organic matter not Bitumen	0.21 per cent.
Mineral matter (Ash)	0.07 per cent.
Sulphur	0.56 per cent.
Total	100.00 per cent.

The total Bitumen contains the following substances:

Asphaltene	26.17 per cent.
Petrolene	73.55 per cent.

Physical tests show:

Specific Gravity	0.998	
Softens at	154.4	Deg. F.
Flows at	192.	Deg. F.

The Seamans Hollow Concrete Block Machine.

The Seamans machine is a new candidate for popular favor as a means of making hollow concrete building blocks, having been patented February 10, 1903. The inventor proposed to make a block which could be handled by one man and could be given any desired form or face and has been successful. The machine will make at one operation two blocks each 8 by 8 by 16 inches with two holes each 4 by 5 inches, and by changing the sides of the mold any desired form of face can be given to any side of the block. The insertion of wooden blocks or patterns in the machhine makes it possible to change the form and size within the limits named, to make resting places for joists, channels for wires and pipes, etc. For some forms sand can be used in place of wooden blocks.

The machine is light and consists of side pieces with proper fastenings, a piece separating the two blocks, a bottom with core openings all of cast iron, and a base to which the covers are attached. The process of setting up the machine and making a block is very simple and can be carried through by two rather inexperienced persons quickly and successfully.

The base with cores is set as low as may be desired, preferably on a bench slightly above the floor level; the cast iron base is slipped over the cores; the

sides and ends are set in place and clamped with a screw or by a single motion as may be desired. The concrete made of a slightly moist mixture of sand and Portland cement is tamped in and the excess of the mortar is scraped off level with the mold. A planed plank is then placed on top and the machine is turned over on the bench so that the blocks rest on the plank. The cores are then removed, the base plate taken out and the sides taken off, being set for a new pair of blocks at the same time. The completed blocks are then set away to harden on the plank.

The only cast iron is in the machine and any number of blocks can be set aside to harden by supplying the planks on which to deposit them from the machine. The planks project beyond the ends of the blocks and thus it is possible by putting in upright separating blocks to pile the stones in tiers, thus saving much floor space without the expense and difficulty of handling found if a permanent rack is furnished.

Mr. Seamans puts the machine on the market at a figure which seems to be satisfactory as he reports that a number of good sales have already been made.

He has also a process of treating cement concrete which he says hastens and intensifies the hardening of the cement, which can be applied if desired.

A drawing showing the machine will be found in an advertisement on another page. Inquiries for further information may be sent to E. M. Seamans, Grand Rapids, Mich.

A New Continuous Flow Water Softening Plant.

Plans have been prepared by the engineering department of the Pittsburg Filter Manufacturing Company for a "continuous flow" water softening plant with especial reference to railroad needs, in which some novel features are incorporated. In a general way the process is this: "Raw water" from any source is admitted through a water motor, feeding through a six-inch pipe, to the precipitation tank, 30 feet high. Connected with the water motor are two rakes, one operating in a lime reservoir, the other in a soda receptacle. As the water enters the precipitation tank, but before being discharged into it, the fluid is carried through a 12-inch pipe in which are placed a given number of baffle plates. Meanwhile the motor has forced the requisite amount of lime water or soda water into the 12-inch pipe, where, with the aid of baffle plates, the water and the purifying agents are thoroughly mixed. After the water is thoroughly mixed it enters the open space in the precipitation tank, passes out through the filters and enters the roadside tank. Under average conditions a plant with a daily capacity of 300,000 gallons would cost approximately $5,000.

The plant is designed particularly for the supplying of purified water for locomotive consumption at a very low cost. The plant can be operated from the ground, there being no necessity for an employe to ascend to the top of the precipitation tank.

A Portable Asphalt Paving Plant.

The readers of advertisements of the Toledo Asphalt Patcher Company have some of them been led to believe that this company makes only patcher or repair plants, but, while this was the original intention of the designer, the success of the apparatus has led to an increase in capacity on the same lines so that in the many small contracts where but 500 to 800 square yards of concrete only can be laid in a day, the larger plant constructed by this company just meet the requirements for asphalt laying. The company does make the repair plants which were its first success, but it also makes plants of somewhat larger size for laying new work.

Improvements for the Allis-Chalmers Company.

The Allis-Chalmers Company will on May 1st remove their General Offices from the present location in the Home Insurance Bldg. to the New York Life Bldg., corner of Monroe and La Salle Streets, Chicago. This move is only another indication of the progressive spirit which prevails in the management of this strong industrial company. The Allis-Chalmers Company has for the past two years been expending enormous sums of money in betterments at their various plants in Milwaukee, Chicago and Scranton, so as to give their customers the best possible service in point of economy and quick deliveries. The new offices of the Allis-Chalmers Company will provide ample space for the various sales departments, and general business offices which will be conducive to the best possible service to their trade.

To give an idea of the scope of the business enjoyed by the Allis-Chalmers Company, it may be said that during the past two months orders for either engines, mining machinery, rock-crushing machinery, saw-mill machinery or flour mill machinery were booked from every state in the union, besides the following foreign countries: England, South Africa, Mexico, Canada, Chile, Central America, Brazil, West Australia,

Turkey, Finland, Yukon Territory, Belgium, British Columbia, Bolivia, Hawaiian Islands, Peru, Alaska, China and the Philippine Islands.

The West Allis plant is nearing completion and makes a very large increase in the capacity of the company's plants. Two machine shops, blacksmith shop, pattern shop and a section of the foundry are completed and plans are prepared for quadrupling this plant, each building being approximately 125 by 575 feet. The layout is a model of convenience and should make the handling of work very economical of time, labor and expense.

Plant for Removing Sulphuric Acid from Water.

The W. Dewees Wood Company Department of the American Sheet Steel Company, McKeesport, Pa., have contracted with Wm. B. Scaife & Sons Co., of Pittsburg, Pa., for a 5,000 H. P. We-Fu-Go Water Softening & Purifying System.

This plant, in addition to supplying the boilers with pure water, freed from the sulphuric acid, with which the Monongahela river is impregnated, is to supply water used in the process of manufacturing some of the finer grades of sheet iron. Sulphuric acid has always been the bugbear of steam users, where this kind of water had to be used in the boilers. The We-Fu-Go system has been used a number of years for removing the free acid, as well as any scale forming substances present in water with perfect success. This is the third contract placed with Wm. B. Scaife & Sons Co., by the American Sheet Steel Company, during the last four years for a water softening and purifying system; those in operation are giving perfect satisfaction.

Trade Publications.

An address by Josiah Marvel before the students of the department of finance and economy of the University of Pennsylvania on the subject of "Delaware Corporations" is distributed by the Delaware Charter Guarantee and Trust Company of Wilmington, Del.

The Barrett Manufacturing Company of Chicago issues a booklet descriptive of its manufactures of tarred felts, roofing pitch, tar, concrete, asphalt coating, paints, varnish, roofing, sheathing, etc.

Catalogue No. 15 of the Allis-Chalmers Company describes and illustrates its cement machinery, including Gates ore and rock breakers, elevators, revolving screens, fine breakers, crushing rolls, rotary dryers, grinders, ball and tube mills, mixing pans for marl and clay, pumping machinery for marl, rotary kilns, storage bins, coolers, coal crushers and disintegrators and steam engines. It is illustrated with views of machinery and of cement plants.

The uses of Portland cement are discussed in a handsomely illustrated pamphlet issued by the Peninsular Portland Cement Company at Cement City, Mich.

The Great Northern Portland Cement Company of Detroit, Mich., send "The Story of an Ancient Arrayed in Modern Garb," as a setting of the advantages of their location for cement manufacture.

Drake's Mixing Machinery for continuous or batch mixing for concrete, asphalt and mortar is described and illustrated with views of machinery at work and structures on which it has been used. It is issued by the Drake Standard Machine Works of Chicago, and should be consulted by any one wanting this class of machinery before purchases are made.

The Smith Mixer is described in a circular issued by the Contractors' Supply Co. of Chicago, Ill.

The Arlington vegetable boiler composition is explained in a pamphlet entitled "The Sign of the Preservative," issued by the Arlington Mfg. Co. of Canton, O.

The Barney Brick Conveyor System is described and its operation illustrated in Catalogue No. 75 of the Jeffrey Manufacturing Company of Columbus, O., the catalogue containing also some examples of the many other lines of this company.

The stock book of Hoffman, Cockran & Co., Chicago, contains all kinds of rope, twine, thread, etc.

The American Process Company issues a handsome catalogue describing the principles and operation of the American Process Dryers and showing its advantages. Almost any kind of organic or inorganic matter can be successfully handled in it, our readers probably being most interested in its application to such materials as cement mixtures, coal, marl, sand, stone, garbage and sewage.

Trade Notes.

ASPHALT.

A company has been organized by J. T. Ray of Salt Lake City, Utah, to develop asphalt deposits near Dewey Springs, Col. The deposits contain veins of sand, asphaltum and 17 per cent. lubricating oil. A plant will be erected.

The Fulton Asphalt Paving Company, Chicago, Ill., has been incorporated to manufacture asphalt paving material. The incorporators are H. R. McElroy, H. E. Pierpont and W. E. Cullen.

The Senate Asphalt and Oil Company has been incorporated by Senators Ogborn, Whitcomb, Powell and Wolcott and Union B. Hunt, former secretary of state of Indiana, and G. B. Powell of Indianapolis, A. J. Crawford, G. A. Conzman and M. T. Hidden of Terre Haute. The company was incorporated at Pierre, S. D., but the company's headquarters will

probably be at Terre Haute. The company has 350 acres of oil-producing land in the Moorecroft and Bellefourche fields, in Cook county, Wyoming, which are rich in asphalt deposits. Union B. Hunt is president, G. A. Conzman treasurer and M. T. Hidden secretary of the company.

The Missouri Asphalt and Oil Company has been incorporated in New Jersey by John H. Roy, Pearle B. Bonisteel and B. B. Harlan.

The Tar Springs Asphalt Company has been incorporated at Loco, Indian Territory, to develop lands and build a refinery. Capital stock, $400,000. R. V. LeGrand is interested.

The McCall Construction Company, San Francisco, Cal., has been incorporated by W. M. Spencer of Oakland; Fred H. and Frank McCall, Fresno; A. J. O'Brien, Fresno; A. A. Smith, San Francisco. The company is manufacturing and constructing street pavements and sidewalks of a new asphaltum composition, the invention of Fred McCall.

BRICK.

The Everett Brick Clay Company, Everett, Wash., has been incorporated to manufacture brick, tile, sewer pipe, etc., with the following officers: President and treasurer, C. A. Rotluff; secretary and general manager, Julius Cobeaux. Capital $30,000.

The Davenport Paving Brick & Tile Company has placed its plant at Buffalo, Ia., in operation, and two large kilns are being erected.

The Rich Hill Vitrified Brick & Tile Plant, at Rich Hill, Mo., has been purchased by G. H. Conklin, of Pittsburg, Kan. The plant which has been idle for a long time, will be repaired and placed in operation.

The Burlington Paving Brick Company, Galesburg, Ill., has instituted a new locker system in the new bathroom which was fitted up recently for its employes. The lockers are of wire, built in sections 8 ft. long and 2 ft. wide, and each section is subdivided by wire partitions into 16 compartments. Each compartment is fitted with a door secured by a spring lock, and each lock requires a single key to open it, so that no employe can unlock any compartment but his own.

The National Building Material Company, Norfolk, Va., has been incorporated to manufacture brick, paving blocks, artificial stone and clay and cement products.

CEMENT.

The American Limestone & Cement company, Watertown, Pa., has been incorcorporated by C. D. Eaton, John G. McHenry, Alice M. Eaton, J. R. McAnell and Charles C. Evans.

The Winters Gypsum company has been organized to operate near Sandusky, O., by H. A. Charles, C. and L. B. Winters, John F. Williams and George H. Gaw.

The Turkey Lake Cement company, Ann Arbor, Mich., has 450 acres of marl lands at Turkey Lake, between Lime and Bass Lakes, where it will erect a plant. Some of the incorporators are Mayor R. S. Copeland, Oliver M. Martin, Moses Seabolt, Titus F. Hutzell, Harrison Saule and Howard Reed of Ann Arbor. Capital, $1,500,000.

The Belleville Portland Cement company, Ltd., Belleville, Ont., has been incorporated by Fred Kielly, H. M. Murton, W. J. Phillips, Nicholas Sweetman and Thomas Croucher.

Stephens, Cooper & Co., 419 Market-st., Camden, N. J., has been incorporated to manufacture cement, lime, etc., by Henry C. Stephens, George F. Stephens and J. N. Fitzgerald.

The North American Portland Cement company, Warsaw, Ind., has been incorporated to manufacture cement from the marl deposits about Eagle Lake.

The establishment of a large cement plant at Culver, Ind., is contemplated according to press reports.

The Silexoid Portland Cement Co., Union City, Mich., has been incorporated in Illinois.

The Washington Coal, Coke & Cement Co., Washington, D. C., has been incorporated by Chas. W. Emboy, Otto J. N. Burkart and Frederick D. Cook, to operate and deal in mines and stone quarries.

The National Portland Cement Company of Ann Arbor with capital of $1,500,000 and the Toledo Portland Cement Company of Manchester, with capital of $500,000 have been incorporated in Michigan.

The Osborn Engineering Company, Cleveland, O., has completed plans for the proposed cement plant, which the Struthers Furnace Company will build at Struthers, O.

The Mason City Lime and Cement Company of Mason City, Ia., has been incorporated to manufacture Champion prepared lime, and to deal in Portland and natural cements. These parties are owners of a patent kiln for burning lime that has proven a great success. Their white lime has shown by analysis to be 99 per cent. pure and their brown lime 98 per cent. and slightly hydraulic, and being unquestionably of the purest limes manufactured in the state.

The Nazareth Cement Limestone Company was incorporated at Camden, N. J., Feb. 13.

Tests are being made of chalk, stone and lime rock deposits in the vicinity of Des Moines, and if they are found satisfactory a cement plant may be established in that city within a year. S. C. Lee of the S. C. Lee Lumber Company and the Iowa Brick Company are interested in the project.

The Quaker City Portland Cement Company, is preparing to build a large cement plant near Easton, Pa. Mr. Carthart of the Northampton Portland Cement Company, Northampton, Pa., is president of the Quaker City Company.

The new plant of the Empire Portland Cement Company, Warner N. Y., built to replace the one destroyed by fire about a year ago, will be placed in operation March 15

The Penn Allen Portland Cement Company, Allentown, Pa., has been incorporated by Avon Burnes, W. H. Gangerwen, S. Addison Wershampel, William R. Yenger and James K. Bowen of Allentown.

The Toledo Portland Cement Company, Toledo O., was recently organized under the laws of the state of Michigan to develop cement deposits near Manchester, Washtenaw county, Michigan. The officers of the company are: President, Dr. William Watts, Toledo; resident secretary and treasurer, C. M. Cooley, Manchester, Mich.; secretary and treasurer, Albert W. Butter, Toledo; general manager, R. T. Van Valkenburg, Laporte, Ind.; consulting engineer, R. C. Carpenter, Ithaca, N. Y.; general counselor, J. A. Garver, Toledo; resident attorney, A. G. Water, Manchester. The company will install the latest equipped plant. The general offices will be in Toledo, and for the present are at 526 The Nasby.

The Kalamazoo Portland Cement Company of Kalamazoo, Mich., which was organized in January, 1908, has opened general offices in the Doyle block, in charge

of N. B. Hall, secretary and general manager. The works of this company will be located at Schoolcraft, about eight miles from Kalamazoo, on the L. S. & M. S. R. R. Plans are now being prepared for a large plant. The officers of the company are: S. A. Armstrong, president, Selina, O.; N. B. Hall, secretary and general manager, Kalamazoo, Mich.; R. B. Good, treasurer, St. Marys, O.

The Hudson Portland Cement Company of Hudson, N. Y., was incorporated Feb. 19. Lyman C. Smith, Syracuse, N. Y., is at the head of the enterprise and will probably be elected president of the company. The authorized capitalization was $6,000,000. The company owns 1,000 acres of land on which is a practically inexhaustible supply of marl and shale. The cement beds are about two miles from the Hudson river. A large cement plant, with a capacity of 2,000 barrels per day, will be put in operation in a few months.

C. O. Bartlett & Snow Company of Cleveland have lately received orders for their special common sense conveyor for conveying cement clinker with capacity of 1,750 barrels a day from the Bronson Portland Cement Company of Bronson, Mich., and from the Omega Portland Cement Company of Jonesville, Mich., also for one of 1,000 barrels capacity from the Egyptian Portland Cement Company of Detroit, Mich.

LIGHTING AND POWER.

The United States Electric Light & Traction Co. has been organized at Portland, Mo., to construct plants to generate and supply electricity and gas for all purposes. The officers are: President, H. P. Sweetsir of Portland; treasurer, Edward W. Guptil of Portland.

The Southern Light & Traction Co., New Orleans, La., has been organized for the purpose of acquiring or constructing street, suburban and interurban railways, electric light plants and power houses and gas plants in the interior towns of Louisiana and Mississippi. The officers of the company are: President, Sol Wexler; vice-president, J. H. Ingwersen; secretary, G. H. Hovey; treasurer, R. J. Kennedy.

The Morrison Electric Lighting Company, Morrison, Ill, has been incorporated to furnish electric current and steam heat by A. V. Viner, Luther R. Ramsey and Samuel L. McCalmont.

The Fryeburg Electric Light Company, Fryeburg, Me., has been organized to supply electricity for all purposes. The officers are: President, Henry B. Cotton, Conway, N. H.; treasurer, Albro R. Jenness, Fryeburg.

The Columbus Electric Company, Portland, Me., has been incorporated to carry on a general suburban and interurban railway business. The officers are: President, Ardon W. Coombs, Portland; treasurer, Gardner Rogers, Brooklyn, Mass.

The Mexican Light & Power Co., Ottawa, Canada, has been incorporated to seek power necessary to utilize to the full all concessions, franchises, etc., obtained from the federal or municipal authorities in Mexico.

The Ferno Manufacturing Company of Brooklyn, N. Y., has been incorporated to manufacture heating and lighting appliances, by F. W. Sparks, T. P. Keenan and H. J. Sparks, of New York City.

Newly incorporated electric light companies: Eddy Electric Co., Windsor, Conn.; Bay Electric Light & Water Works Co., Bay St. Louis, Miss.; Jackson Lighting Co., Jackson, La.; Bozeman Light & Traction Co., 15 Exchange Place, Jersey City, N. J.; Long Island Hydro-Carbon Arc Light Co., New Hyde Park, N. Y.; Citizens' Water, Light & Power Co., Los Angeles, Cal.; Leonard Bundy Electric Co., Cleveland, O.; Chicago Street Lighting Co., Chicago, Ill.; Missouri American Electric Co., St. Louis, Mo.; McCreary Electric Co., New York City; United Gas & Electric Corporation, Augusta, Me.; Boysen Light & Power Co., Brownwood, Tex.; High Point Electric Power Co., High Point, N. C.; Hamilton Cataract Power, Light & Traction Co., Hamilton, Ont.

MISCELLANEOUS.

The Illinois Composite Stone Company, Peoria, Ill., has been incorporated to manufacture artificial stone, by A. E. Robbins, H. A. Barrett and Adam Saal.

The right to manufacture the Palmer concrete stone at Appleton, Wis., has been purchased by W. K. Gochnauer.

The Concrete Stone Company, Youngstown, O., has been incorporated by Albert A. Pauly, Richard Garlick, W. W. Bownell, Albert H. Beuhrie and Myron E. Dennison.

A second-hand eight-ton steam road roller, that can be made ten tons when filled with water and coal, is desired. Address communications to Municipal Engineering Company, Indianapolis, Ind.

The New Jersey Bridge Company, Villa Park, N. J., has been incorporated to build bridges and to operate mills by Chasper W. Dean and Philander E. Lane of New York and John A. Eaton of Villa Park.

The C. O. Barrett & Snow Company, Cleveland, O., is in receipt of a large order for fertilizing machinery from the West Rand Fertilizer Company, Krugersdorp, Transvaal, South Africa.

The National Sand and Gravel Company, Allegheny, Pa., is being organized to dig sand and gravel from the local rivers. Frank L. Voeckley is president, and William Liseman, George Koehler, John Onslow of Allegheny and A. Smith of Hoboken are directors.

The Camden Auxiliary Fire Alarm Company, Camden, N. J., has been incorporated by Stanley L. Conklin, L. Endin, Willard Morgan, Peter V. Voorhees and William J. Bradley of Camden.

The Portland Sand and Gravel Company, Portland, Me., has been incorporated by George W. Brown, Sumner Libby and C. A. Vincent.

An electric interurban railway, 40 miles in length, is to be built from Rochester through Canandaigua to Geneva, N. Y. The road will be known as the Rochester & Eastern Rapid Railway. The Comstock-Haigh-Walker Company is building and equipping the line, and expects to have it in operation by next July.

The Federal Waste Paper Receptacle Company, Chicago, has been incorporated under New Jersey laws. The company's business will be in Chicago and the New Jersey office is in the headquarters of the New Jersey Registration and Trust Company, East Orange, N. J. The incorporators are F. S. Peabody, George F. Getz, Frank R. Greene, Arthur W. Underwood and James P. Connery.

The Rice Lake Stone Company, Rice Lake, Wis., has been organized to manufacture cement sidewalks, tile and building blocks.

The Summit Park Stone Company, Buffalo, N. Y., has been incorporated to quarry and crush stone by Jas. Savage, Edmund P. Fish and Geo. H. Kilman of Buffalo.

E. F. Janke of Fairbault, Minn., and W.

D. Sprague of Mapleton, Minn., have formed a company for the manufacture of cement sidewalks.

A new boiler plant will be established at Pekin, Ill., by Thos. Murphy and John McNamara. The new company contemplates building iron and steel bridges and other structural iron work.

A company has been formed in Marshalltown, Ia., to manufacture hollow cement blocks for building purposes.

The Whatcom Artificial Granite and Stone Works, Whatcom, Wash., have been incorporated to manufacture artificial stone from sand. The incorporators are Thos. Taylor, Jas. Brown, A. H. Wright and August Wilson.

The Central Concrete Block Company, Kittery, Me., has been organized to make machinery for the manufacture of cement and concrete buildings blocks. The officers are: President, Albert A. Knowlton; treasurer, Chas. C. Smith, Kittery, Me.

The Northampton Bridge Company and the Warren Bridge Company, 4 Union-square, Philipsburg, N. J., have been incorporated to construct and operate toll bridges by John H. Hoggerty, Harry H. Haines, Waldo H. Swain, John F. Riley and Wm. R. Grubb.

The Chicago House Wrecking Company is building some extensive additions to its large plant at the corner of Thirty-fifth and Iron-sts., Chicago, Ill.

The Buffalo Forge Company of Buffalo, N. Y., has moved its Cleveland offices to 1114 Citizens' Building, where Mr. A. J. Vance, in charge of their Ohio business, will have a large increase in space.

SEWER PIPE.

Th erection of a large brick and sewer pipe plant at Bridgeton, Ind., is proposed by parties from Waveland, Ind., according to press reports.

The question of the city of Winnipeg, Man., manufacturing its own sewer pipe is being discussed again.

The consolidation of the independent manufacturers of sewer pipe has been effected, according to press reports, including the following companies: Fire Clay Company, Canal Dover, O.; Robinson-Merrill Pottery Company, Akron, O.; Royal Sewer Pipe Company, Millvale, O.; Canton & Malvern Fire Brick Paving Company, Canton, O.; and the Lock Haven (Pa.) Sewer Pipe Company. The headquarters of the concern will be in Akron. Its stated capitalization is $2,000,000. A number of sewer pipe companies are still operating independently.

Recent Inventions.

713,982. Nov. 18, 1902. Wheeled scoop. J. J. Gyldenborg, Grenada, Miss.

713,994. Nov. 18, 1902. Fireproof floor. John Krolman, New York City. Combination with rolled metal bar and angle bars, with a layer of heavy concrete, a layer of plaster applied on the under side and a layer of lighter concrete upon the heavier concrete.

714,126. Nov. 25, 1902. Hose protector for railway tracks. H. H. Arnold, Cincinnati, O., assignor of one-half to Frank Bauer, same city, comprising anchor plates at each end, bridging rails, pillow blocks and means for uniting the structure detachably to the rails.

714,185. Nov. 25, 1902. Catch basin cover and sewer inlet. F. H. Jackson and Y. M. Pierce, Cleveland, O. A suitable casing and a drop plate adjustably supported at its ends.

714,204. Nov. 25, 1902. Tunnel construction. Gustav Lindenthal, New York City. A tunnel foundation comprising a number of piles with their upper ends protruding through the casing and carrying the load.

714,205. Nov. 25, 1902. Method of laying tunnels. Gustav Lindenthal, New York City, consisting in weighting down the river bottom, thereby forming an air-resisting medium or zone, and then driving the tunnel.

12,059 (Reissue) Nov. 25, 1902. Crematory. Felix L. Decarie, Mineapolis, Minn,. assignor to the Decarie Manufacturing Company.

714,682. Dec. 2, 1902. Cellar-drainer. Orlando E. Erwin, Chicago, Ill. A cellar-drainer comprising inlet and discharge ducts, an injector, an inclosing drum or chamber whose walls form a screen through which seepage water enters the drum; and a tubular sleeve.

714,709. Dec. 2, 1902. Filtration apparatus for municipal or commercial uses. James P. Keane, Cincinnati, Ohio, assignor of one-half to Edward N. Roth, same city.

714,716. Dec. 2, 1902. Combined curb and conduit. Frank Lappin, Washington, D. C., assignor of one-half to J. J Weed, same city, and E. D. N. Whitney, Minneapolis, Minn. Combination of a series of rectangular metallic troughs having flanges at the ends to bolt them together, and provided with brackets to receive the cables.

714,801. Dec. 2, 1902. Apparatus for the in the Treatment of Sewage. H. B. Killon, Manchester, England. Comprising a series of purification beds, inlet and outlet posts and means for charging the beds.

714,807. Dec. 2, 1902. Apparatus for Making Sand Bricks. L. T. Leet, Montreal, Canada. Is an apparatus for the steam-slacking of lime, the combination of a perforated lime container with means for preventing steam from getting into the container.

714,842. Dec. 2, 1902. Art of Manufacturing Cement. R. F. Wintz, Nazareth, Pa. A method of treating cement-producing material, consisting in applying water in liquid form while the clinker is heated, and simultaneously passing currents of air through the clinker.

714,843. Dec. 2, 1902. Apparatus for the Manufacture of Cement. R. F. Wentz, Nazareth, Pa. Combination of a kiln, means for heating, a clinker cooler, water-supplying devices for the cooler, and a vapor conduit leading from the cooler to the kiln.

714,971. Dec. 2, 1902. Material of Construction. Edwin Thadur, New York City. A unit of construction consisting of a metal bar flattened and laterally extended at intervals, for use as a core to be imbedded in concrete.

714,972. Dec. 2, 1902. Floor Unit. Edwin Thacher, New York City. Combination with two floor units provided with legs and resting upon the supporting beam, and a plaster filling-piece, and a top extension piece to cover the top flange of the beam.

715,286. Dec. 9, 1902. Street-car fender. Joseph Nosick, Prague, Austria-Hungary.

Comprising a movable frame with net, and springs at the rear, actuated by a double-round rocking lever.

715,423. Dec. 9 1902. Point for metallic and earthenware pipes. George F. Ryan, Chicago, Ill. Combination with an earthenware pipe, of an expansion ring provided with an annular flange, a fitting provided with a tapered sleeve, and means for forcing the tapered sleeve into the ring.

715,433. Dec 9, 1902. Artificial stone post H. D. Streator, Galesburg, Mich. Binding rods having loops on their ends embedded in a concrete body, the meeting ends of the rods overlapping.

715,458. Dec. 9, 1902. Street-sweeper. John T. Collins, Hartford, Conn, assignor to the Hartford Motor Machine Company, same city.

715, 554. Dec. 9, 1902. Cistern filter. J. U. Crane, Winfield, Kas. Comprising inner and outer perforated domes with filtering material sandwiched between, a pump for removing liquid from the inner dome and a vent for supplying air in place of the water removed.

715,630. Dec. 9, 1902. Method of preparing the ingredients of street pavements or roadways. F. J. Warren, Newton, Mass. A method of selecting and combining the mineral ingredients for use in the manufacture and construction of street sheet pavements.

715.766. Dec. 6, 1902. Street or Other Sign. E. F. Dreman, Cleveland, O. A tubular post having notches in its top, in combination with a street sign supported by arms engaged in the notches, and a plug securing the arms in the post.

715,962. Dec. 16, 1902. Excavating Apparatus. Rensselaer Bowler, Kokomo, Ind. Rotary means for breaking up the earth, a conveyer for removing the broken earth, and means for propelling the apparatus at a speed proportionate to the work of removing the earth.

715 986. Dec, 16, 1902. Core for making cement blocks. R. B. Coltrim, Jackson, Mich. Combination with side numbers have downward projections at their lower extremities of rivets connecting the members together and braces connected to the side members by rings at the top.

716,028. Dec. 16, 1902. Building construction. Secondo Giletti, San Francisco, Cal. A wall composed of hollow blocks laid to form a series of vertical flues, metallic columns in certain of the flues and a cement filling in the spaces surrounding the columns.

716,098. Dec. 16, 1902. Street guide or sign. F. K. Plumbly, New York City.

716, 124. Dec. 16, 1902. Combined Scraper and Scoop. S. M. Spangler, Newton, Kas. A scoop having a sharpened edge with tines projecting from the edge and a draft-loop connected to the outermost rims.

716, 173. Dec. 16, 1902. Measuring rule. J. A. Traut and F. Z. Traut, New Britain, Conn.

716, 173. Dec. 16, 1902. Suction dredge. L. M. Bates, Chicago, Ill. In combination with a wellway, a shaft extending across the wellway, a series of independent suction-pipes journaled upon the shaft, and means to shift the pipes and dredge laterally.

716,371. Dec. 23, 1902. Process of Finishing Artificial Stone. W. Black and H. S. Richards, Chicago, Ill. Treating artificial stone with acid bath and subsequent neutralizing solution to expose the superficial ingredient sand particles of the composition.

716,446. Dec. 23, 1902. Construction of Chimneys, Walls, etc. Jonathan F. Lyman, South San Francisco, Cal. Strips or plates hinged together for exterior form, rigidly locked, tubes of terra-cotta or earthen ware kept in alignment, for receiving concrete, thus forming a wall or chimney with hollow tubes or flues; also details of construction.

716.462. Dec. 23, 1902. Apparatus for Drying and Heating Sand. W. C. McElheny, Pittsburg, Pa. In the heating chamber some fixed ledges of brick or tile, inclined in opposite directions, from two opposite walls and above, hinged plates similarly arranged with apparatus for changing their inclinations.

716,628. Dec. 23, 1902. Fire-proof Flooring. Alex. Dickey, Newark, N. J. Steel floor beams, previously molded concrete slabs resting on lower flanges forming ceiling ready for plastering, cinder filling between webs of beams, concrete floor surface on top, concrete also inclosing entire beams, and having wire or metal reinforcement if desired, no forms being necessary.

716,689. Dec. 23, 1902. Method of Manufacturing Red Aggregates for Use as Artificial Stone, etc. Herbert W. C. Kempton Dyson, London, Eng. Method of coating sand grains with red oxid of iron by chemical reaction to make permanent red color, forming with cement an artificial stone, and for other uses.

716,784. Dec. 23, 1902. Device for Removing Snow. Jas. Sullivan, New York City. Portable frame with chute and pipe extending to sewer, having roller supports. Snow is dumped into frame and washed by stream of water into the sewer.

716.838. Dec. 23, 1902. Fireproof Flooring. H. E. Grant and J. G. McDowell, Pittsburg, Pa. Concrete-steel construction, providing improved connecting bars and refractory slabs to do away with centering.

716,861. Dec. 30, 1902. Apparatus for Manufacturing Artificial Stone. W. Bugler, Stuttgart, Germany. Wagons carrying molds for artificial stones or slabs, hopper for filling them, compresser and cutter.

716,898. Dec. 30, 1902. Fence Post. C. H. Hutchings, Toronto, Can. Concrete post with two parallel rods extending full length and two sockets on opposite sides near each end of the post, each having a shank with elongated opening and two opposed ends having a bottom plate and two side plates to which to attach fence rails.

717,032. Dec. 30, 1902. Water Filtering or Cleaning Plant. H. C. Schlichter, Singen, Germany. An inclined water channel, descending steps inclining backward, intermediate partitions over each, separated therefrom by open space, causing downward circular motion of water and separating impurities by centrifugal force to lodge in corners.

717,293. Dec. 30, 1902. Dumping-Vehicle. C. H. Smith, Greeley, Col. A frame, load

box swinging on it, pulley above, pulley connected with box, chain extending round the pulleys and a winding shaft.

717,349. Dec. 30, 1902. Street-Sweeper. William Hight, Macon, Ill. A frame, rotary brush and driving mechanism, a shoe with pins projecting from the ends and working in diagonal slots in the frame, knee and shaft for raising rear end of frame.

717,420. Dec. 30, 1902. Drive-Well Point and Strainer. George Leeson, Lake City, Minn. A central tube with perforations, a coupling for attaching to well-tube, a point attachable to strainer encircling it and an outer removable perforated jacket with similar spaces between.

717,580. Jan. 6, 1903. Rotary Mixer for Concrete. W. J. Judd, New York City. A cylindrical drum open at the ends, supported on anti-friction rollers and revolving on a horizontal axis; a rotating shaft with blades, serving as mixer and conveyer and shaft for driving both motions in the same direction at different speeds.

717,835. Jan. 6, 1903. Excavator. W. H. Filcher, Oakland, Cal. Portable frame work and means for advancing on line of excavation, an extension from the frame with endless chain excavating mechanism movably supported at outer end and apparatus for raising and lowering inner end of guides and chain-sprockets.

717,912. Jan. 6, 1903. Drainer for Garbage Digesters. E. S. Peck, Cleveland, O. A garbage-receptacle having a perforated bottom with a drainage structure supported on it consisting of vertical perforated plates forming radial intercommunicating compartments open to communicate with the bottom.

717,920. Jan. 6, 1903. Protracting Device. A. S. Prall, Port Richmond, N. Y. A table with a large protractor and an indicator of its center hinged to the table outside the protractor.

718,009. Jan. 6, 1903. Metallic Matrix for Building Blocks. W. C. Lyon, Hyattsville, Md., Rods, castings with lugs, carried thereby, and stay wires.

718,029. Jan. 6, 1903. Road Scraper and Grader. C. A. Slaughter, Jacksonville, Ill. Front and rear drags at angle with each other, one throwing material into field of the other.

Reissue 12,072. Jan. 6, 1903. Smoke-consuming Furnace. H. E. Parson, Brooklyn, N. Y. Combination of air-channels with furnace for delivering hot air under pressure to the ash-pit, air being heated as it is forced by blower through pipe within the fire-chamber.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Sioux Falls, S. D.—(Special.)—P. T. Connelly, cement sidewalk contractor, completed 6 miles of cement walks last season. The city now has 18 mls. in all.

Washington, D. C.—The supreme court of the United States handed down a decision Feb. 23 sustaining the Indiana Barrett law. A full report of the decision will be given in the April number of Municipal Engineering.

St. Joseph, Mo.—All paving in this city is at a standstill, as the supreme court must first pass upon the question of the validity of all paving ordinances affected in any manner by the board of public works bill before bids will be submitted in good faith by contractors.

legality of a provision of the city charter. Elm-st. will be paved by the city from the Houston & Texas Central Ry. to Crowdus-st. under the provisions of the city charter authorizing the city council to declare a street and the property to be benefited a special paving district, and have the street paved and levy an ad valorem tax on the property within that district to pay for same. The amendment to the city charter was passed several years ago, but no contracts have been let under it from the fact that the law has never been tested and contractors did not care to take the risk until it was known whether the supreme court would hold the law to be constitutional.

Columbus, Ind.—(Special.)—Wm. H. Rights, cy. engr., says that the asphalt paving, for which bids will be received March 5 for repairing 3,225 sq. yds., was laid 5 years ago by the Ayers Asphalt Paving Company of Zanesville, O., under a 7-year guarantee. Suit will be brought against the company for failure to keep its guarantee good.

East St. Louis, Ill.—(Special.)—Jas. F. Parr, asst. cy. engr., says that, in accordance with an ordinance passed by the city council to rename the streets in uniformity, street signs are being erected—the first ever placed in the whole city.

Dallas, Tex.—The property-owners on E. Elm-st., the city of Dallas, and the Barber Asphalt Paving Company have entered into an agreement to test the

CONTEMPLATED WORK.

Richmond, Ind.—Paving is proposed for N. A-st.

Columbus, O.—Bellows-ave. will be paved with macadam.

Erie, Pa.—A resolution has been adopted to pave Ash-st.

Rochester, N. Y.—New paving is proposed for South-ave.

Temple, Texas—The improvement of the streets is contemplated.

Lancaster, O.—A resolution was adopted Feb. 9 to gravel E. Wheeling-st.

Toledo, O.—A petition has been approved for paving Newberry-st.

Methuen, Mass.—Macadam paving is desired in different parts of the city.

Charlestown, Ind.—The construction of 24 miles of free gravel roads is proposed.

Woonsocket, R. I.—Paving is proposed for Blackstone, Clinton and Cumberland-sts.

Sedalia, Mo.—New petitions will be circulated for paving Main-st. Cy. engr Zoll.

London, Ont.—The city council contemplates the purchase of the tar macadam plant.

Woonsocket, R. I.—Paving is proposed for Blackstone, Clinton and Cumberland-sts.

Newark, O.—The construction of sidewalks on a number of streets is being considered.

Superior, Wis.—The question of macadamizing 2 miles of Bardon-ave. is being discussed.

Rochester, Ind.—The streets around the court house and Main-st. will be paved with brick.

Richmond, Ind.—Brick or cement sidewalks are proposed for N. H-st., from 8th to 10th.

Davenport, Ia.—The city council adopted revised paving plans Feb. 18 for 15 streets.

St. Paul, Minn.—Asphalt paving has been approved for Exchange-st. and Central-ave.

Columbus, O.—Ordinances were passed Feb. 16 to pave Oregon, Noble and Trevett-sts.

Superior, Wis.—The macadamizing of 2 mis. of Bardon-ave. next summer is contemplated.

Ft. Worth, Tex.—Paving is proposed for the w. s. of Houston-st., between Fourth and Fifth-sts.

Belleville, Ill.—Asphalt paving is proposed for Race-st., from Main to Fifth-st. Mayor Halstead.

Hutto, Tex.—The citizens are urging the question of macadamizing 2 mis. of public roads.

Hartford, Ind.—The property-owners on Jefferson-st. are considering plans for paving it.

Richmond, Va.—The street committee of Clopton has decided to improve Lemmes and Stockton-sts.

Duluth, Minn.—Sandstone block paving is proposed for E. Michigan-st. W. P. Patton, cy. engr.

Toledo, O.—A petition to pave Parkplace, between Ashland and Woodruff-aves., is being circulated.

Syracuse, N. Y.—Plans and specifications have been approved for paving certain streets with asphalt and brick.

Gonzales, Tex.—The question of issuing $7,000 bonds for street work will be voted on March 3.

Binghamton, N. Y.—State-st., from Henry to Lewis, will be resurfaced with brick this summer.

Los Angeles, Cal.—Asphalt paving on concrete base is proposed for Main, Eighth and Seventh-sts.

Worcester, Mass.—Plans for widening Shrewsbury-st. to a width of 100 ft. to the lake is being discussed. F. A. McClure, cy. engr.

Riverside, Cal.—Asphalt paving is proposed for Main-st., according to local press reports.

Joplin, Mo.—A resolution was passed Feb. 16 to grade and macadamize an alley. Mayor Mertz.

Spokane, Wash.—About 50 mis. of sidewalks will be constructed this year, according to reports.

Hibbing, Minn.—Nashwauk, a new town voted Feb. 9 to issue bonds for road and bridge improvements.

Fond du Lac, Wis.—This city will vote on the question of issuing bonds for paving Main-st. Mar. 5.

Des Moines, Ia.—Bids will be asked for soon for paving Southeast Ninth-st. and E. Sixteenth-st. with brick.

Indianapolis, Ind.—Petitions have been filed for cement walks on Denny-st. and Euclid-ave.

Malden, Mass.—The street commissioners have recommended an appropriation of $49,000 for street improvements.

Trenton, N. J.—An ordinance has been introduced for repairing the paved streets. Frank S. Katzenbach, jr., mayor.

Victoria, Tex.—The city council is considering the matter of building cement walks around the public square.

Gaithersburg, Md.—Favorable action was taken Feb. 10 on petitions for street crossways. Town clk. Cramer.

Cincinnati, O.—Ordinances have been adopted for paving S. Gregory-ave. with asphalt and Witler-st. with brick.

Lancaster, O.—Plans has been adopted for building a sidewalk in Fifth-ave., between Maple and High-sts. Cy. engr. Woolfe.

Baker City, Ore.—Mayor Carter is considering the question of purchasing a steam road roller and rock crusher.

Everett, Wash.—(Special)—This city contemplates paving about 10 blocks of streets with asphalt next season.

St. Joseph, Mo.—The Brookdale Improvement club will agitate the question of improved streets and sidewalks.

Chicago, Ill.—Asphalt paving has been decided upon for W. Huron, Cleaver and W. Dunning-sts., and S. Campbell-ave.

Ballard, Wash.—Estimates have been approved for brick paving, granite curbing and cement walks on Ballard-ave.

Cohoes, N. Y.—The cy. engr. was directed Feb. 11 to prepare plans for paving Reservoir-st. from Egbert to Division.

Camden, N. J.—Petitions have been received by the city council asking for the repaving of a large number of streets.

Orange, N. J.—A hearing will be given March 16 on the proposed macadamizing of Hickory-st., from S. Market to Central-ave.

Madison, Ind.—Main-st. will be paved this year, the material to be determined by a committee from the city council.

Salt Lake City, Utah.—A new petition for paving S. Temple-st., from State to Tenth East-st. has been submitted to council.

Albany, N. Y.—An ordinance has been passed for paving Broadway from Steuben to State with asphalt. Cy. engr. Melius.

Decatur, Ill.—Ordinances have been passed for resurfacing portions of E. Main and Water-sts., 31,260 sq. yds. with asphalt.

Saginaw, Mich.—Resolutions are pending for building brick sidewalks in a large number of streets. William H. Barton, cy. clk.

Penitac, Mich.—Paving is contemplated for Huron-st. The material has not yet been decided upon. William J. Foster, cy. engr.

West Duluth, Minn.—The petition which is being circulated to secure paving for Central-ave. is meeting with good success.

Des Moines, Ia.—Many miles of gravel road will be built in Pock county during next season. Frank Morros, supv.

Erie, Pa.—About 25,000 sq. yds. of brick paving, 7,000 sq. yds of stone and 440 sq. yds. of asphalt paving is contemplated.

Seattle, Wash.—A resolution was introduced Feb. 16 to pave 1st-ave. S. with vitrified brick, with granite curbs, sewers, etc.

Riverside, Cal.—The report of the com. appointed to investigate asphalt paving submitted its report Feb. 9, which was filed.

Jacksonville, Fla.—The cy. engr. has been directed to prepare ordinances for paving a number of streets with brick and shell.

Philadelphia, Pa.—The estimated cost of the proposed boulevard to Torresdale is less than $2,500,000, the original estimate.

Indianapolis, Ind.—The property owners on Sixteenth-st., from the L. E. & W. R. R. to Hillside-ave., have petitioned for flint rock macadam paving.

Rome, N. Y.—City Engineer Schillner will prepare plans and specifications for paving N. Madison-st. with brick, asphalt and macadam.

Wabash, Ind.—Specifications have been adopted for 32,000 sq. yds. of brick, asphalt or bithulithic macadam paving. John Hilty, cy. engr.

Oyster Bay, L. I., N. Y.—The construction of a macadam road 1½ mls. long from Locust Valley R. R. depot to Lattington is contemplated.

Moundsville, W. Va.—A petition has been circulated and will be submitted to council asking for the paving of Lafayette-ave. and Sixth-st.

Sidney, O.—The matter of paving the streets around the public square has been referred to the street and law committee for investigation.

Connersville, Ind.—The council has ordered plans and specifications prepared for paving Central-ave., Fourth, Fifth and Sixth-sts. with brick.

Joliet, Ill.—Petitions are being considered for paving certain alleys with brick, and Ottawa and Van Buren-sts. with asphalt. Mayor Barr.

Portland, Ore.—Resolutions have been adopted for building about 12 mls. of cement sidewalks and paving a number of streets with macadam.

Trenton, N. J.—A bill has been introduced to authorize the construction of a boulevard along the ocean front from Atlantic Highlands to Cape May.

Evansville, Ind.—The construction of 4 mls. of brick and asphalt paving and 5 mls. of artificial stone sidewalks is proposed. Aug. Pfafflin, cy. engr.

Montreal, Que.—The road committee of Westmont, a suburb, has asked for $15,538 for building permanent sidewalks this year. A. G. Cross, mayor.

Houston, Texas.—Citizens on Hamilton st. between Texas and McKinnie-aves. have offered to co-operate with the city in the paving of that thoroughfare.

Paducah, Ky.—A committee has been appointed to investigate the matter of paving Jefferson, Market, 10th and 4th-sts. with brick, asphalt or other material.

St. Joseph, Mo.—Ordinances were passed Feb. 12 for paving Messanie-st. from 22d to 26th with brick, and for macadamizing 14th, Faraon and 26th-sts.

Washington, Pa.—A petition has been submitted to the county commissioners asking that the road from Laboratory to Zollarville, 14 miles, be improved.

San Francisco, Cal.—The board of public works has recommended that 3rd-st. between Mission and Berry be paved with basalt blks. on a 6 in. concrete base.

Niagara Falls, N. Y.—The city engineer has been directed to prepare plans and specifications for paving a portion of Niagara-ave. with asphalt on brick.

Sioux City, Ia.—The Morningside Improvement Association has asked the city council to construct cement walks on a large number of streets in that suburb.

Wichita, Kas.—The cy. clk. has been directed to ask for bids for brick paving on W. Douglas-ave. as soon as the city engr. has completed specifications.

Niagara Falls, N. Y.—The cy. engr. and cy. clk. have been directed to ask for bids for paving Niagara-ave. from Whirlpool to Sugar-sts. with bitulithic macadam.

Milwaukee, Wis.—The cy. atty. has been asked to prepare a bill regulating the award of asphalt paving contracts in this city, the bill to admit of competition.

Cohoes, N. Y.—Hearings will be held Mar. 4 in the proposed paving of Imperial and Johnston-aves. and Amity, Columbia, Ontario and Saratoga-sts. Pub. impv. comn.

Marinette, Wis.—Petitions have been filed asking for macadam paving on Newberry and Riverside-aves., Liberty, Stanton, Wells, Main, Mary and Park-sts. and Ella Court.

Danville, Ill.—Ordinances have been passed for 15,000 sq. yds. of brick pavement, 5,000 lin. ft. stone curbing and 3,300 ft. of 8 in. sewer. W. H. Martin, cy. engr.

Ft. Worth, Tex.—Property owners on 8th-st. from Main to Throckmorton have about decided to have the street paved, but have not agreed on the kind of material to use.

Mankato, Minn.—Mayor Peterson recommended to the city council, February 2, macadam paving for 2nd, 4th and 5th-sts., from Warren to Washington, and for a number of cross streets.

Yarmouth, Mass.—An appropriation of $10,000 has been secured for improving Queen Anne road, macadamizing Bank-st. and Pleasant Lake road and constructing a shell road at Harmick Centre.

Mount Morris, Ill.—The question of building cement walks along two blocks in the business section of this village is being agitated by the Index. J. E. McCoy, prest. vil. bd. trustees.

Houston, Texas.—(Special) John W. Maxcy, supt. county roads, says that Harris county contemplates the expenditure of $600,000 for good roads. Contracts have been let for the work.

Newark, N. J.—An ordinance has been passed to pave Ogden-st. between Division and Cross-sts. Petitions have been submitted for grading, curbing and flagging S. 19th-st. and Hunterdon-sts.

Newark, N. J.—Notice of intention of paving certain sts. with granite blks. on sand foundation, asphalt or brk. on concrete, and Telford paving, has been filed. J. Crowell Mundy, genl. supt. wks.

Harrisburg, Pa.—The East Harrisburg Improvement Association has appointed com. to ascertain the kind of pavement desired on 17th, Walnut, 13th, Derry, Market and State-sts. A. L. Groff, prest. assoc.

St. Paul, Minn.—The bd. of pub. wks. approved paving Feb. 9 as follows: Exchange-st. 3rd to Cedar, asphalt; Central-ave. Cedar to Robert, asphalt; 6th Rosabel to the bridge, material undecided.

St. Paul, Minn.—A preliminary order

was sent to the board of public works Feb. 17 for paving University-ave. from Rice to Dale. An appropriation of $10,000 accompanied the order, for paving street intersections.

New Castle, Ind.—The contract let last year for paving S. 14th-st. has been declared void by the city council and bids will again advertise for grading and graveling the street and building cement walks.

Newark, N. J.—The question of constructing an automobile boulevard across the Kearney Meadows is being revived. General Roy Stone, who is making the surveys, will submit his report to the Automobile Club Mar. 5.

Clinton, Mo.—Some of the property owners on Franklin-st., between Washington and Water, have petitioned for vitrified brick paving. Resolutions had been passed for paving the street with asphalt. Mayor Armstrong.

Savannah, Ga.—Asphalt paving is desired for Gaston-st. by the property owners who have asked that they be credited with what they originally paid for the shell pavement. If this is agreed to, the suit against the city will be dismissed.

Boise, Idaho—Councilmen Lomax, Annett and Morrow have been appointed a committee to ascertain the cost of the various kinds of paving material preparatory to paving Main-st. between 5th and 13th. Mayor Alexander.

Bay City, Mich.—The bd. of public works decided Feb. 16th in favor of paving Cass-ave. from Water-st. to the main line of the Pere Marquette R. R. with tar macadam. The street railway right of way will be paved with vitrified brick.

Memphis, Tenn.—Bids will be asked for soon for paving a number of streets with macadam. J. A. Omberg, cy. engr., states that these streets will be paved with asphalt at some future time, when this proposed macadam paving will be a good foundation.

St. Louis, Mo.—The bd. of pub. improvements will consider petitions Mar. 5 for improving and reconstructing a large number of alleys. Ordinances have been recommended for reconstructing Waterman-ave., Twelfth, High, Fifteenth, Sixteenth and Jay-sts. and Page boulevard.

Michigan City, Ind.—The property owners on W. Fourth-st. from Washington-st. to Willard-ave. have petitioned for paving. H. A. Miles, cy. engr., has been directed to prepare plans and specifications for a sidewalk on Boston-st. from Michigan to York. Mayor Krenzer.

Pittsfield, Mass.—A bill is proposed providing for certain changes in the city charter, which will authorize the city to grade and pave any public street, highway or part thereof with granite blocks, vitrified brick, asphalt or other suitable solid material.

Cincinnati, O.—A resolution was passed Feb. 18 providing that no more term contracts be made for the repair of asphalt streets on acount of the near approach of the time for the new code to go into effect. Until that time the repair work will be paid for by the yard.

Elgin, Ill.—Petitions are being circulated to pave S. State-st., from Locust to Walnut, with asphalt; W. Chicago-st. with brick and Dundee-ave., from North to Summit-sts., with asphalt. The estimated cost of 12,192 sq. yds. of asphalt paving on Grove-ave. is $29,991.

Atlantic City, N. J.—The cy. coun. has offered to pave Atlantic-ave. from California to Massachusetts-aves., with brick, and from Massachusetts to Maine-aves. and California to Jackson-aves. with macadam, if the railroad company will keep it in repair thereafter.

Crawfordsville, Ind.—Declaratory resolutions have been introduced for paving Wabash-ave. with bitulithic macadam paving and Pike-st., from Water to Walnut, with vitrified brick. Also for constructing cement sidewalks on College, Jefferson, Mill, John and How-sts.

Wyoming, O.—(Special.)—L. W. Matthewson, vil. eng., says that 2,300 sq. yds. of cement concrete sidewalks and 3,000 cu. yds. of macadam roadway will probably be constructed next season. It is also possible that about 4,400 lin. ft. of cement concrete curb and gutter will be constructed.

St. Louis, Mo.—Plans to convert Chestnut-st. into a boulevard connecting downtown business districts will be discussed before the bd. of pub. imp. Feb. 20. Mayor Wells is in favor of asphalt paving for the thoroughfare. Bids were introduced Feb. 10 for paving 12 sts.

Dennison, Tex.—The special com. on the permanent improvement of Marie-st. has recommended that a meeting of the property-owners be called for the purpose of deciding whether to pave with vitrified brick or asphalt. N. H. L. Decker and M. J. Sweeney, com.; Mayor Kennedy.

Belvidere, N. J.—The Warren county bd. of freeholders decided Feb. 13 to build 3½ miles of macadam road in Greenwich, 1¼ miles in Pohatcong, 4¾ miles in Independence tpw., 3 miles on road leading from Belvidere to Roxburg. The estimated cost of macadamizing these roads is $35,000 to $40,000.

New Brunswick, N. J.—James DeHart, freeholder, has proposed as a means of freeing the county of tramps, that Middlesex county purchase a stone quarry and a stone crusher to be operated by the county road roller's engine, and employ tramp labor to convert the quarry's product into stone suitable for building and repairing county roads.

CONTRACTS TO BE LET.

Menominee, Mich.—Sealed bids are asked until 5 p. m., March 16, for vitrified brick paving and stone curbing on Main-st., from Ogden to Wells-aves. Wm. Somerville, cy. clk.

Vallejo, Cal.—Bids are asked until April 6 for 6,000 sq. yds. of asphalt. A. P. Noyes, cy. engr.

Florence, Ariz.—Bids are asked until April 6 for constructing a road. Thos. G. Peyton, clk. bd. supvrs.

Cincinnati, O.—Bids are asked until March 3 for paving Homer-st. with asphalt. Geo. F. Holmes, clk. B. P. S.

Jefferson Barracks, Mo.—Bids are asked until March 12 for constructing roads. Col. J. W. Jacobs, St. Louis, Mo.

Somerville, N. J.—Bids are asked until March 4 for macadamizing a road in Bridgewater twp. W. J. Logan, dir.

Cleveland, O.—Sealed bids are asked until March 5 for paving thirty-three streets with brick. Chas. P. Salen, dir. pub. wks.

Columbus, Ind.—Sealed bids are asked until March 5 for repairing 3,225 sq. yds. of asphalt paving. Wm. H. Rights, cy. engr.

Ft. DeSoto, Fla.—Sealed bids are asked until 4 p. m. March 6 for constructing roads, walks and gutters. Frank S. Long, A. Q. M.

Tiffin, O.—Sealed bids are asked until March 11 for paving S. Washington-st. with brick or asphalt block. C. J. Peters, cy. engr.

Roanoke, Va.—Bids are asked until March 5 for grading, macadamizing and

guttering portions of Marshall-ave. J. H. Wingate, cy. engr.

Ironton, O.—Bids are asked until March 5 for paving 6th-st. with macadam on furnace cinder or ash foundation. Geo. H. Davies, cy. clk.

Albia, Ia.—Bids are asked until 7:30 p. m. March 2 for 8,768 sq. yds. of brick paving, 4,902 lin. ft. stone curb and 200 cu. yds. extra grading. P. J. Baird, cy. clk.

Rensselaer, Ind.—Bids are asked until 12 m. March 4 for constructing the South Barkley gravel road, 44,561 ft. in length. Jas. C. Thrawls, supt.

Trenton, N. J.—Bids are asked until March 3 for paving Barnes-st. with asphalt on 6-inch concrete base and Kersey alley with vitrified brick. C. E. Murry, cy. clk.

Augusta, Ga.—Bids are asked until March 2 for 52,000 sq. yds. of brick or bitulithic pavement to be laid on the old concrete foundation. Jacoby Phinizy, mayor.

New York.—Bids are asked until March 3 for resurfacing and repaving with macadam on present pavement prepared as a foundation Seventh-ave. Jacob A. Canter, boro prest.

Atlanta, Ga.—Sealed bids are asked until 3 p. m. March 2 for 10,400 sq. yds. of asphalt paving on Peachtree-st., and 10,600 sq. yds. on Peters-st. R. M. Clayton, cy. engr.

St. Paul, Minn.—Sealed bids are asked until 2 p. m. March 2 for improving Dale-st. with sandstone curbing, filling and leveling from Fairmount-ave. to St. Anthony-ave. R. L. Gorman, clk. B. P. W.

Newburgh, N. Y.—Bids are asked until March 2 for 15,000 sq. yds. of macadam paving, 9,700 sq. yds. of brick paving, 3,300 lin. ft. curbing, with catchbasins and sewer manholes. Everett Garrison, cy. engr.

Wapakoneta, O.—Sealed bids are asked until 10 a. m. March 19 for grading, culverts and stoning Wubker pike, from Schmeider-pike to Shelby county line; grading, culverts and graveling Werner-pike. Samuel Craig, co. engr.

Brooklyn, N. Y.—Bids are asked until March 4 for 20,693 sq. yds. of asphalt paving, 3,345 cu. yds. concrete, 37,120 sq. yds. granite paving with sand joints, 114,128 sq. ft. cement sidewalk, 28,899 lin. ft. new curb. J. E. Swanstrom, boro prest.

Winnipeg, Man.—Sealed bids are asked until 8:30 p. m. March 3 for a supply of 300 to 600 tons of asphalt for street paving. Sealed bids will also be received until 8:30 p. m. March 3 for 15,000 to 20,000 barrels of cement. C. J. Brown, cy. clk. H. N. Ruttan, cy. engr.

Toledo, O.—Bids are asked until March 2 for grading and paving Union-st. with blocks on a 6 in. concrete or 8 in. sand foundation; Paine-ave. with vitrified paving blocks or asphalt blocks on concrete or sand or broken stone foundation. Charles H. Nauts, cy. clk.

Columbus, O.—Sealed bids are asked until 12 m. March 9 for paving Sullivant-ave. from Hawkes to Glenwood-aves. and Garfield-ave. from Mt. Vernon to Fulton-aves., with asphalt, granite or other stone blocks, hard burned bricks or blocks, macadam or other material. John A. Connor, clk. B. P. W.

Indianapolis, Ind.—Sealed bids are asked until March 8 for constructing gravel roadways, cement walks and brick gutters in Palmer-st., Cottage-ave. and Eleventh-st.; cement walks in Douglass-st.; brick roadway and stone curbing in Ellsworth-st. Sealed bids are asked until March 10 for gravel roadway and cement walks in Jones and New York-sts.; cement walks and curbing in Dunlop and Nineteenth-sts. Harold C. Megrew, chmn. B. P. W.

Montreal, Que.—Sealed bids are asked until March 5 for the supply and delivery of vitrified clay pipes and inverts, coal tar, creosote, tar, pitch, cement, oils brick, etc., curbstones, scoria blocks and flagstone for sidewalks and crossways, and paving blocks, cartage and crossings, curbstones, and scoria blocks. L. O. David, cy. clk.

Memphis, Tenn.—Bids will be received until March 5 for furnishing supplies for the entire year as follows. Granite paving blocks; Arkansas blue stone paving blocks; rubble limestone; curbstones and curb setting; granite cross walks; sewer pipe; paving brick; macadam; cement; lime; concrete combined curb and gutters; granolithic sidewalks; rounding up dirt streets and cleaning gutters; cementing gravel; miscellaneous road metals; river sand; building brick; cedar piling and general hauling. J. A. Omberg, jr., cy. engr.

CONTRACTS AWARDED.

Dayton, O.—O. E. Brentlinger was awarded the contract for 7,370 sq. yds. of paving for $10,051.

Three Rivers, Mich.—Jas. E. Conley was awarded the contract for brick paving, Wassall block to be used. E. H. Moore, Chicago sales agent.

Cincinnati, O.—The contract for paving Oregon-st. with brick has been awarded to Evan Evans for $12,237.

Toledo, O.—The contract for paving Eleventh-st. with Logan block was awarded to Garrigan Bros. for $2,413.

Madison, Wis.—R. F. Conway & Co. of Chicago was awarded the contract Feb. 9 for paving Main, Carroll and Mifflin-sts. with asphalt.

Beaumont, Tex.—The Texas Construction Company has been awarded the contract for paving Fannin-st., between Main and Orleans, with bituminous asphalt.

Syracuse, N. Y.—The contract for paving E. Kennedy-st., from S. State to Grape, was awarded to the Barber Asphalt Paving Company Feb. 16 for $3,687.55.

Tacoma, Wash.—Contract were awarded to C. M. Moore of this city Feb. 19 for constructing cement sidewalks in Steele-st., between N. Eighth and Twenty-third-sts., for $10,900.

Morton Park, Ill.—The contract for macadamizing Linden-ave. and Thirty-first-st. was awarded Feb. 5 to the Savage Construction Company, 1403 Security Bldg., Chicago, for $22,565.

Cincinnati, O.—Wm. Fogerty secured the contract for paving Belvidere-st. with brick for $4,050, and H. Dieckmueier for paving Westwood-ave. with brick for $35,457.

Lafayette, Ind.—The contract for paving the Main-st. levee was awarded Feb. 16 to the Western Paving and Construction Company of this city at $5.98 a lin. ft., or $19,910.

Sioux City, Ia.—The property-owners on Jackson-st. have signed a petition asking that the contract for paving that street be awarded to the Barber Asphalt Paving Company.

Ft. Trumbull, Conn.—The Lane Construction Company, of Meriden, Conn., secured the contract for constructing and repairing roads at $2,016 for macadam and $1,449 for gutters.

Louisville, Ky.—The contract for 25,517 sq. yds. of asphalt paving was awarded Feb. 9 to the American Standard Asphalt Company at 71 cents a sq. yd.

The city will lay the concrete foundation. The American Standard Asphalt company owns asphalt mines in Logan county, Ky. It was formerly known as the Parks Asphalt Company.

Chippewa Falls, Wis.—The contract for 25,625 sq. yds. of brick paving was awarded Feb. 14 to Patrick M. McDonald of Duluth, Minn., at $2.19 a sq. yd. for Purington brick.

St. Joseph, Mo.—Paving contracts were awarded Feb. 11 as follows: Faraon-st., brick, C. W. Benning, $2.55 a sq. yd., or $11,987.12; Jule-st., brick, $7,226.43, and Robidoux-st., $3,573.73. Phoenix Brick Company.

Union, N. J.—Callary & Murphy, Weehawken, N. J., secured the contract for block and asphalt paving on New York-ave. at $1.75 a sq. yd. for the former and $2.95 a sq. yd. for the latter, or a total of $16,327.

Akron, O.—Paving contracts have been awarded as follows: High-st., Canton metropolitan blocks, James Wildes, $19,-619; N. Broadway, Canton met. blocks, J. M. Davidson, $2,932; Rose-ave., Akron granite block, O. B. France, $6,355.

Mobile, Ala.—The Southern Paving and Const. Company, Chattanooga, Tenn., was awarded contracts Feb. 10 for asp. paving in the 2nd paving district at $1.34 a sq. yd. or $83,906.32 and for vit. brk. paving at $1.35 a sq. yd. of $75,188.25.

Brooklyn, N. Y.—Bids were submitted Feb. 4 for repaving a large number of streets, and for regulating, grading and paving a number of others. For paving Cleveland and Herman-sts. and St. Nicholas-ave. with asphalt the Crawford Company bid $1.50 a sq. yd. and the Uvalde Asphalt Company $1.90 and $2.

Buffalo, N. Y.—Bids were received Feb. 10 for paving two streets as follows, Lord-st., from Seneca to Howard, Barber Asphalt Paving Company, asphalt, $14,012; L. H. Gipp, brick, $14,170. Preston-st., from Hampshire to Perry, Western Construction Company, $875; Barber Asphalt Paving Company, brick, $1,053.

Toledo, O.—Contracts were awarded Feb. 19 as follows: Orange-st., St. Clair to Superior, Medina block stone on concrete base, O'Sullivan & Sheehan, $5,715; 21st-st., between Adams and Jefferson, Wassall block on sand foundation, with Berea curb, O'Sullivan & Sheehan, $3,470; Auburn-ave., from Monroe to Bancroft-st., brick on broken stone foundation, James Sheehan, $11,476.

Newark, O.—Bids were received Feb. 10 for paving and curbing on Cedar-st. as follows: John W. Wagenheim, Berea stone curbing, 45 cts. a lin. ft.; Hutchinson & Gardner, native stone curbing, 34½ cts. a lin. ft.; Brennan & Nutter, brick paving with cement filler, $1.32 a sq. yd.; sand filler, $1.25; Baldwin Bros. & Graham, sand stone curb 38 cts. a lin. ft.; protection curb, 20 cts. a lin. ft. Action was deferred.

Sandusky, O.—Bids were submitted Feb. 7 for paving Hayes-ave. as follows: A. G. O'Donnell—Collinwood block, sandstone curb, $28,591; concrete curb, $28,321.-50; Trimble block, sandstone curb, $26,-960.80; concrete curb, $26,809.44. C. F. Hartman—Bolen brown granite block, sandstone curb, $27,998.20; concrete curb, $27,-496.74; Malvern block, sandstone curb, $27,257.20; concrete curb, $27,084.36; Nelsonville block, sandstone curb, $28,442.80; concrete curb, $28,184.04; asphalt blocks, 4-in. concrete base, sandstone curb, $39,-361.90; concrete curb, $38,562.27; 3-in. concrete base, sandstone curb, $37,779.40; concrete curb, $36,844; 4-in. stone foundation, sandstone curb, $34,074.40; concrete curb, $31,296 and $30,148. Ayers Asphalt Paving Company—Sheet asphalt, sandstone curb, $33,831.95; concrete curb, $32,767.89. The Ohio Bituminous Macadam Company bid on Warren Bros. bitulithic pavement.

St. Louis, Mo.—The lowest bids received Feb. 10 for street improvements were as follows: Parker-Washington Company of West Virginia—West half of Twelfth-st. from St. Charles-st. to Washington-ave., $13,979.55; Broadway from Chippewa to Main-st., $27,293.70; Gravois-ave. from Eighteenth-st. to Jefferson-ave., $48,888.30; Gravois-ave. from Jefferson-ave. to Arsenal-st., $35,504.60. Barber Asphalt Paving Company—Sixth st. from Market-st. to Washington-ave., $9,368.53; Eighth-st. from Market-st. to Washington-ave., $10,-095.26; Tenth-st. from Market to Washington-ave., $11,298.26. Gilsonite Roofing and Paving Company—Broadway, from Market to Chestnut, $2,577.31; Broadway from Chestnut to St. Charles, $9,521.78, and from Clark-ave. to Market, $7,496.64. Wisconsin Graphite and Construction Company—Euclid-ave. from Kings Highway boulevard to Euclid-ave., $2,633.25; Sarah-st. from Duncan to Laclede-aves., $6,-901.05. Fruin & Colnon—California-ave., from Cherokee-st. to Magnolia-ave., $26,-482.30; Eighteenth-st., $13,298. Fruin-Bambrick Construction Company—Sarah-st. from Manchester to Duncan-aves., $17,469.30. Morey Engineering and Construction Company—Page boulevard from West End-ave. to King's Highway boulevard, $48,479.75.

New York City—Bids were submitted Feb. 9 for grading, flagging, etc., in Carter-ave. from E. 173rd-st. to Tremont-ave., Bronx boro, as follows: F. V. Smith—Exca., 1,100 cu. yds., all kinds, 40 cts.; filling, 10,500 cu. yds., 40 cts.; new curb, 3,430 ft., 75 cts.; new flag, 13,500 ft., 23 cts.; new bridgestone, 1,130 sq. ft., 60 cts.; dry rubblestone, 1,430 cu. yds., $1.50. W. F. Murray—Exca., $1.50; fill, 45 cts.; curb, 79 cts.; flag, 29 cts.; bridgestone, 65 cts.; rubblestone $2.90; lumber, 1,000, $25. F. Thielman—Exca., 50 cts.; fill, 50 cts.; curb, 65 cts.; flag, 24 cts.; bridgestone, 55 cts.; rubblestone, $1.50; lumber, $25. D. W. Moran—Exca., 29 cts.; fill, 50 cts.; curb, 70 cts.; flag, 24 cts.; bridgestone, 60 cts.; rubblestone, $2; lumber 30 cts. Uvalde Asphalt Paving Company—Exca., 1 ct.; fill, 44 cts.; curb, 70 cts.; flag, 24 cts.; bridgestone, 55 cts.; rubblestone, $1.50; lumber, $1. Peter Handebolt, jr.—Exca., 65 cts.; fill, 25 cts.; curb, 65 cts.; flag, 20 cts.; bridgestone 50 cts.; rubblestone, $2.90.

Bids were received the same day for paving Prospect-ave., from Southern boulevard to Croton Park, South, Bronx boro, as follows: Continental Asphalt Paving Company—Asphalt, 40,000 sq. yds., $2.25; concrete, 7,200 cu. yds., $6.60; new curb, 5x20 in., 2,000 ft., $1; old curb reset, 13,550 ft., $1. Century Construction Company—$1.30, $5.82, 25 cts. and 51 cts. Asphalt Construction Company—$1.40 and $5.50, 85 cts., 20 cts., 60 cts. Barber Asphalt Paving company—$1.25, $4.88, 82 cts., 18 cts., 61 cts. Bids for asphalt block paving on E. 153rd-st., from Melrose to Morris-ave., were as follows: Continental Asphalt Paving Company—Asphalt block, 3,620 sq. yds., $1.74; concrete, 620 cu. yds., $6.60; old curb, 720 ft., 50 cts. Hastings Pavement Company—$1.68, $6, 55 cts.

SEWERS.

Smithville, Tex.—The Smithville Sewerage Company has been incorporated by A. B. Mayfield, E. Buescher, Y. Hill, J. H. Chancellor and C. H. Turner of this city.

New Orleans, La.—A friendly suit was begun in the civil district court Feb. 19, to determine the constitutionality of the water and sewerage bond issue.

Moline, Ill.—A bill was introduced in the legislature Feb. 20 intended to give more power to boards of local improvement so that they may go ahead with the construction of sewers or the extension of water mains without waiting for petitions for such improvements. Mayor Wessel of this city is the originator of the bill.

CONTEMPLATED WORK.

Johnstown, Pa.—A sewer in Main-st. is proposed.

Avon, N. J.—The borough voted to issue $32,000 bonds for a sewerage system.

Corning, N. Y.—Mayor Miller recommends a bond issue for building new sewers.

Northampton, Mass.—The sewer comrs. will ask for an appropriation of $40,000.

Hudson, Mass.—The estimated cost of the proposed sewerage system is $150,000.

Jeffersonville, Ind.—A sewer on Court-st., from Spring to Walnut-st., is proposed.

Phoenix, Pa.—The citizens are agitating the question of building a sewerage system.

South Bethlehem, Pa.—Specifications for a $100,000 sewerage system have been adopted.

Kansas City, Mo.—Plans for a sewerage system in Sunny Slope have been approved.

Hudson, Mass.—The estimated cost of the proposed new sewerage system is $150,000.

Indianapolis, Ind.—The estimated cost of the proposed Pogue's Run sewer is $1,083,500.

Janesville, Wis.—Plans and specifications for a sewerage system have been completed.

Cape May, N. J.—Plans have been completed for a 14x5 ft. sewer. L. C. Price, cy. engr.

Clarion, Ia.—A drainage ditch 26 mis. long is contemplated and bids will be received soon.

West Point, Miss.—The citizens are considering the matter of building a sewerage system.

Nashua, N. H.—The bd. of pub. wks. is considering the purchase of an appliance to clean sewers.

Dayton, O.—A resolution has been adopted to construct sewers in S. Park at a cost of $24,000.

Stapleton, N. Y.—A resolution has been adopted for building a combined sewer in Osgood-ave.

Evansville, Ind.—A sewer in Kentucky-ave. is contemplated at a cost of $25,000 to $50,000.

Waukegan, Ill.—Plans have been completed for sewer district No. 2. R. J. Smith, supt. pub. works.

Camden, N. J.—Plans will be prepared for constructing sewers on Spruce-st., Mt. Ephraim and Marlton-aves.

Ardmore, Pa.—Lower Merion twp. voted Feb 17 to issue $250,000 for the construction of a sewerage system.

New Britain, Conn.—About five miles of trunk sewers and ten to fifteen miles of lateral sewers are contemplated.

Butterfield, Minn.—Plans are being prepared for a sewerage system and the matter will be voted on in the spring.

Portland, Ore.—The residents of Stephens's addition are agitating the question of sewerage for that part of the city.

Denver, Colo.—The bd. of pub. works will ask the city council to appropriate $3,500 for the repair of the storm sewer.

Beaumont, Tex.—Mr. W. Yeater, cy. engr. has been directed to prepare plans and specifications for sewers and paving.

New York City.—It is estimated that the proposed sewers will cost not less than $4,000,000 nor more than $10,000,000.

York, Pa.—This city voted Feb. 17 to issue $400,000 bonds for a new sewerage system. Chas. P. Shreiner, cy. clk.

Cincinnati, O.—Cy. eng. Stanley will be directed to prepare plans and specifications for a big sewer in Mill creek Valley.

Jackson, Mich.—The construction of a purification plant and intercepting sewer is contemplated. A. B. Stevens, cy. eng.

Hartford, Conn.—A storm water overflow sewer through Elliott-st. and Franklin-ave. and a sewer in Maple-st. are proposed.

Ft. Wayne, Ind.—Resolutions were adopted Feb. 12 for building a system of lateral sewers to drain into the South Wayne sewer.

Washington, D. C.—The district comrs. recommended favorable action on the amendment for continuing work on the Arizona-ave. sewer.

Atlantic City, N. J.—City engr. Hackney favors the dredging of a canal along Drexel-ave. for draining this city, according to local press reports.

Trenton, N. J.—Plans for constructing 110,000 ft. of brick and terra cotta sewers can be obtained at the office of the city engineer after Mar. 1.

St. Bernardsville, O.—The question of issuing $150,000 bonds for street and sewer improvements will be voted on Feb. 28. Mayor Schwegam.

Erie, Pa.—Separate bids will be received soon in the proposed construction of 2,860 ft. of 30, 1,750 ft. 27 in. and 1,826 ft. of 20 in. tile sewers.

St. Paul, Minn.—Cy. engr. Rundlett has submitted plans and specifications for the St. Anthony Park Sewer system. He estimates the cost at $120,000.

Connersville, Ind.—The cy. coun. adopted ordinances Feb. 13 to construct a sewerage system after the plans prepared by Charles C. Brown of Indianapolis, bids to be received about March 26.

Portland, Me.—Rudolph Hering of New York City, estimates the cost of a new sewer to Fore river at $66,671 and if extended to the permanent outfall, $73,250.

Burlington, Ia.—Plans are being prepared for the Stony Lonesome sewer which will be about 4,000 ft. long and will cost about $35,000. Emmet Steece, cy. engr.

Bloomington, Ill.—City Engineer Folsom has been directed to prepare new estimates for building sewers on Taylor, Leland and East-sts. and Willard-ave.

Bridgewater, Mass.—The question of building a sewerage system will probably be submitted at the annual town meeting in March. A preliminary survey has been made.

Haverhill, Mass.—An ordinance was introduced Feb. 19, by request of Mayor Flanders, providing for the construction of a sewer through Kenza-ave. at a cost of $16,000.

Mt. Morris, Ill.—The village trustees have recommended an appropriation of $500 to make surveys for a sewerage system for this village. The matter will be voted on.

Penn Yan, N. Y.—The bd. of water comrs. decided Feb. 12 to engage Knight & Hopkins of Rome to prepare plans for a sewerage system and reduction plant. Geo. H. Excel, town clk.

Rockford, Ill.—Petitions have been submitted to the board of local impvts. for

a sewerage system for the west and northwest ends, including a trunk line on Peach and W. State-sts.

Brookston, Minn.—The city engineer has been directed to prepare plans and specifications for all sewers proposed during the season, and for an entire system in Sampson's addition.

Rockford, Ill.—A resolution is proposed which provides for the appointment of D. W. Mead, C. E., as supervising engineer for the large sewerage system that is contemplated. Mayor Hutchins.

Belleville, Ill.—Mayor Halstead, cy engr. Graner and the bd. of aldermen have returned from a trip through the northern part of the state where they examined septic sewer systems, and all are in favor of that kind of system for this city.

Kansas City, Mo.—Plans have been prepared for constructing sewers as follows: District No. 102, 1,100 ft. pipe sewers, $4,400; No. 235, 3,700 ft., $6,000; No. 193, 9,800 ft. pipe sewers and 3,000 ft. brick sewers, 25 manholes, 27 catchbasins, $32,000.

Wyoming, O.—(Special)—L. W. Mathewson, village engineer, says plans have been prepared for constructing sewers at a cost of about $35,000. He states that on account of the delay caused by the new municipal code this work may be delayed until 1904.

Petoskey, Mich.—W. S. Shields, C. E. of Chicago estimates the cost of constructing a complete sewerage system for the business and residence portions of the city at $11,000. The septic tank and settling beds would cost $3,000 to $4,000 more.

New York City—J. A. Cantor, prest. boro. of Manhattan says that unless the entire sewerage system is reorganized the residents of Manhattan island may find themselves victims of an epidemic. He says that to reorganize the system will require an expenditure of $10,000,000.

Houston, Tex.—Plans for the proposed sewerage system for the Third and Fourth wards and the fair grounds addition have been completed by cy. engr. Dormant. Additional plans will be made for complete drainage system for this city. The question of borrowing $34,000 for constructing sewer extensions will be voted on April 7.

Newark, N. J.—James M. Seymour, jr., has proposed a plan for the purification of the Passaic river, which provides for the irrigation and flushing of the river by means of water from the Hudson river. This salt water, according to the plan, would be run into the Passaic through a ship canal, about 7 mis. long, to extend from Garfield or the Passaic, to Bulls Ferry, on the Hudson. He estimates the cost of the canal at $11,000,000.

CONTRACTS TO BE LET.

Manchester, Ia.—Bids are asked until Mar. 6 for building a sewer. R. R. Robinson, cy. clk.

Bowling Green, O.—Bids are asked until Mar. 14 for building pipe sewers. Alex Williams, clk.

Muncie, Ind.—Bids are asked until Mar. 2 for building a trunk sewer in Second-st. R. G. Hickok, cy. clk.

Vallejo, Cal.—Bids are asked until April 6 for constructing 2,500 ft. of 8-in. sewer. A. P. Noyes, cy. engr.

New York City—Bids are asked until Mar. 3 for building a sewer in Exchange-place. Jacon A. Canter, prest. boro. Manhattan.

Meriden, Conn.—Bids are asked until Mar. 5 for furnishing c. i. pipe, brick and cement for new sewers. W. S. Clark, cy. engr.

Toledo, O.—Sealed bids are asked until Mar. 9 for building brick and pipe sewers in certain streets. Chas. H. Nauts, cy. clk.

Georgetown, S. C.—Bids are asked until Mar. 18 for constructing 5 mis. of 8 to 15-in. pipe sewers. J. B. Steele, chmn. b. p. w.

Rock Island, Ill.—Bids are asked until Mar. 3 for constructing the Hampton drainage ditch, involving 91,000 cu. yds. of excavation.

Marshfield, Wis.—Bids are asked until Mar. 30 for constructing about 6 mis. of storm sewers, septic tank and filter beds. C. S. Vedder, cy. clk.

Independence, Ia.—Sealed bids are asked until Mar. 9 for constructing sewers on certain streets. P. McCorstin, chmn. com. on sewers; Rufus Brewer, cy. clk.

Kokomo, Ind.—(Special.)—W. F. Mann, cy. engr., says contracts will be let Mar. 9 for constructing 2,500 ft. of 12-in. and 2,490 ft. of 24-in. pipe sewer.

Brooklyn, N. Y.—Bids are asked until Mar. 4 for constructing 2,464 lin. ft. of 12 to 24-in. vitrified stoneware pipe sewers, 15 manholes and 5 receiving basins. J. E. Swanstrom, boro. prest.

Dayton, O.—Bids are asked until Mar. 17 for constructing 2,150 ft. of 12-in. to 5-ft. concrete and brick sewer, 4 catchbasins, 6 manholes and 40 perches of stone masonry.

CONTRACTS AWARDED.

G. P. Walker secured the contract for a sewer in Observatory-ave. for $12,380.

Toledo, O.—The M. Rabbitt & Sons Company was awarded the contract for extending the Jefferson-st. sewer for $7,905.12.

Schenectady, N. Y.—Beckwith Bros. secured the contract Feb. 10 for constructing sewers in the extension of E. Liberty-st. for $6,259.

New Orleans, La.—The contract for building a sewerage system in portions of this city has not yet been awarded owing to lack of a quorum.

Weehawken, N. J.—The contract for constructing a sewer and pumping station in Lower Weehawken was awarded to Thos. Cavanaugh for about $40,000.

Tacoma, Wash.—The contract for building a sewer in E. Eighth, Ninth, Cedar and other streets was awarded Feb. 17 to Jas. Lee of this city for $1,050.

Pasadena, Cal.—The contract for a big sewer in the eastern part of the city was awarded Feb. 3 to the Fairchild-Gilmore-Wilton Company for $11,434.40.

New Lisbon, N. J.—The contract for a sewerage plant at the Burlington county insane asylum was awarded Feb. 11 to Jas. O' Neill of Burlington for $2,195.

The question of issuing bonds for building sewers will be voted on at the following places: Babylon, N. Y., $50,000, March 17; Lincoln, Neb., $34,000.

St. Paul, Minn.—C. Johnson was awarded the contract Feb. 9 for building a sewer in Lawson-st. for $1,528, and P. H. Doherty for a sewer in an alley for $497.

The construction of sewerage systems is contemplated at the following places: Plainfield, Ill.; Holly Springs, Miss.; Demopolis, Ala.; St. John, N. B.; Centerville, Ia.

Washington, D. C.—The contract for constructing the sewage pumping station at the foot of New Jersey-ave., S. E., was awarded to Ambrose B. Stannard of New York City for $548,220.

Muncie, Ind.—Sewer contracts were awarded Feb. 9 to Lyons & Delaney of this city for a sewer in Perkins-ave. for $9,655 and one to W. M. Birch Feb. 17 for a sewer in Gharkey-st. for $4,089.

Buffalo, N. Y.—The lowest bid received

Feb. 19 for constructing a 24-in. brick and a 20, 18 and 15-in. tile sewer in Downey-st., between S. Park-ave. and Julius-st. was that of Wm. Franklin, $2,650.

Washington, D. C.—Sewer contracts were awarded Feb. 18 as follows: Jefferson-st., Anacostia, Andrew Gleason, $1,484; Cathedral-ave., N. W., M. F. Talty, $2,468; D and 14th-sts., M. F. Talty, $3,403.85.

Indianapolis, Ind.—The contract for the W. Michigan-st. sewer, for which bids were received Feb. 25, will probably be awarded to Eugene Sheehan at $2.68 a lin. ft. No bids were received Feb. 18 for constructing a sewer in Roosevelt-ave., Pine and Harrison-sts. and Commerce-ave.

WATER-WORKS.

Laporte, Ia.—The Laporte Utility Company has been incorporated to construct water works, electric light plants, etc. W. D. Wagoner, president; Otto Wettstein, secy.

Birmingham, Ala.—The Sheffield Company has been incorporated in New Jersey. It will build water works, electric light and street railway systems in the vicinity of Florence, Sheffield and Tuscumbia.

New Albany, N. Y.—A. M. Barron, formerly of the New Albany Water Works Company, has organized a syndicate, composed principally of Chicago and eastern capitalists, for the purpose of consolidating the water and electric light plants of the small towns in Indiana. The company has already secured 15 plants.

CONTEMPLATED WORK.

Rochester, N. Y.—A water meter system will probably be installed.

Mt. Pleasant, Tex.—Plans and specifications for a water works system have been adopted.

Franklin, Mass.—Municipal water works are favored by the Franklin Business Association.

Springfield, O.—The new water plant is to be equipped with gas engines and a power pump.

San Diego, Cal.—A bond issue of $225,000 for improving the water works system has been recommended.

Storm Lake, Ia.—A reservoir at the lake is proposed for purifying the water. W. C. Edson, cy. clk.

Wilmington, Del.—The question of issuing bonds to construct a new reservoir and filter is being considered.

Colorado Springs, Col.—The city council has voted to issue $459,000 bonds for extending the water system.

Berwyn, Ill.—The question of installing water meters is being discussed by the citizens and village board.

Sarnia, Ont.—The question of enlarging and improving the water works system will be voted on. Mayor Cook.

Vallejo, Cal.—The plans of Cy. Engr. Noyes for a new high-level distributing water works system have been accepted.

Sioux City, Ia.—The Morningside Improvement Association has asked for the extension of water mains in that suburb.

Lake Wilson, Minn.—Plans for a water works system will be made by W. D. Lowell of Des Moines. Martin Forest, Vil. Recorder.

Minneapolis, Minn.—Andrew Rinker, cy. engr., estimates the total cost of the new Northeast pumping station at $444,000.

Cambridge, Mass.—The water board recommends, in its annual report, the immediate installation of a complete meter system.

Vermillion, S. D.—The citizens are agitating the question of municipal ownership of the water works and electric light plants.

Mankato, Minn.—Petitions have been submitted to the council asking for water mains on Walnut-st., from Front to Second. Mayor Peterson.

Asbury Park, N. J.—The construction of an elevated storage reservoir has been recommended by Supt. Coffin, of the water dept.

Lima, O.—The city will expend $150,000 next summer in improving the water works system. A big dam near Lafayette is proposed.

Verona, Wis.—Plans and specifications for a water works system for the Dane County Poor Farm will be prepared by W. G. Kirchoffer, of Baraboo.

Sausalito, Cal.—An advisory committee has been appointed to assist the town trustees in securing a water supply. J. Thomas, prest. bd. trustees.

Tacoma, Wash.—City Engineer Taylor has completed plans for an all-gravity system for supplying the flats with water. The total estimated cost is $8,000.

Sheboygan, Wis.—A committee has been appointed to investigate the advisability of building a municipal water works and electric light plant.

West Orange, N. J.—Councilmen Gillick, Reid, Kenney, Gannon and Frye have been appointed a committee to take steps toward securing an independent water supply.

Lancaster, O.—Plans will be prepared by Charles Fultz for installing gas engines with power pump, to be used in pumping water to the reservoir. A. C. White, w. w. trustee.

Richfield, Utah.—The plans for the proposed water works system provide for a concrete and cement intake tank below the spring, and an 8-in. main down Third North-st.

Boston, Mass.—The proposition to construct a dam across the Charles river at Craigie Bridge was given a hearing before the Joint Committee on mercantile affairs and land and harbors, Feb. 10.

Collinsville, Mass.—A petition is being circulated by the business men requesting the selectmen to submit the question of organizing a fire district and providing a water works system to vote.

Fort Collins, Wyo.—Mayor Baker and Aldermen Brown and Whitton have been appointed a committee to investigate the question of increasing the water supply and to change its source by extending the line about the North fork of the Poudre.

The question of issuing water works bonds has been favorably voted on as follows: Pauls Valley, Ind. Ter., Saratoga, Wyo.; Dillon, Mont.; Manning, Ia.; Ruthven, Ia.; Dedham, Ia.; Havre, Mont.; Ruthven, Minn.; Pomeroy, Wash.; Avon-By-The-Sea, N. J.; Washington, La.

The questtion of issuing water works bonds will be voted on as follows: Spanish Fork, Utah; Sheboygan, Wis.; Rice Lake, Wis., Feb. 27; Mayville, Wis.; Elgin, Tex.; Rich Hill, Mo., March 10; Freeman, S. D.; Antioch, Cal.; R. W. Hall, town clk. Pierce, Utah, March 7; Wayland, N. Y.; Sandersville, Ga.; Milford, O., March 14.

The construction of water works is contemplated at the following places: Lake Preston, S. D.; Alexandria, S. D.; Phoenix, Ariz.; Clarion, Ia.; Silver City, Ia.; Tewksbury, Mass.; Penns Grove, N. J.; Douglas, Ga., C. T. Roan, mayor; Centerville, Wash.; Carbondale, Colo.; Parker, S. D.; Cameron, Mo.; Williamsburg, Va.; West Milton, O.; Flora, Ill.

CONTRACTS TO BE LET.

Fort Mott, N. J.—Bids are asked until March 10 for a 35 h. p. steam boiler and connections for the water system at this post. Q. M.

St. Paul, Minn.—Sealed bids are asked until March 16, for a 300,000-gal. gasoline pumping engine for Phelan park. Matt Jensen, secy.

Bottineau, N. D.—Bids are asked until March 4 for boring a deep well, including casing, pipe and pump complete. N. P. Nordin, co. audt.

Ft. Totten, N. Y.—Sealed bids are asked until 2 p. m. March 3 for constructing a water and sewerage system at this post. A. Hosbrouck, Q. M.

Cleveland, O.—Sealed bids are asked until March 12 for furnishing and delivering c. i. water pipe and special castings. Charles P. Salen, dir. pub. wks.

Yonkers, N. Y.—Sealed bids are asked until 8 p. m. March 5 for furnishing water pipe and special casting. Joseph H. Beall, prest. bd. water comrs.

Marietta, O.—Sealed bids are asked until March 7 for 10,000 to 15,000 bbls. of Portland cement to be used in the construction of a reservoir. C. F. Holst, secy. W. W. Trustees.

Kansas City, Mo.—Sealed bids are asked until 12 m. March 5 for furnishing and laying a 36-in. c. i. water main from Quindaro pumping station to Kaw Point pumping station. Baxter Brown, secy. B. P. W.

Georgetown, S. C.—Sealed bids are asked until March 18 for constructing water works, embracing 9 mis. of pipe, standpipe, air lift plant and other appurtenances. J. B. Steele, chmn. comrs. pub. wks.

Allentown, Pa.—Sealed bids are asked until 6 p. m. March 3 for extending the water works system, including the laying of 5 mis. of 30-in. c. i. pipe and erecting a standpipe 10-ft. in diameter and 100 ft. high. G. J. Kohler, prest. bd. water comrs.

CONTRACTS AWARDED.

Gentry, Ark.—A water works franchise has been granted P. A. Miller.

Smith's Grove, Ky.—A water works franchise has been granted J. R. Kirby.

Pikesville, Ky.—A water works and sewer franchise has been granted W. B. Cox of Williamson.

Great Falls, Mont.—The contract for furnishing water mains was awarded to the Crane-Ordway Company of St. Paul for $20,000.

Kansas City, Mo.—The contract for installing a pump at Quindaro station was awarded Feb. 9 to the Worthington Company for $27,274.

Searcy, Ark.—The contract for a water works, and electric light plant has been awarded to W. A. Rees of Fayetteville for $29,890.72.

Punxsutawney, Pa.—The Buffalo, Rochester & Pittsburg Ry. Company has awarded a contract to the Pittsburg Filter Company of Pittsburg, Pa., for a water softening plant.

New Britain, Conn.—The contract for pipe and special castings was awarded Feb. 9 to the Warren Foundry and Machine Company of Phillipsburg, N. J., at $5.80 a ton, or $6,000.

Beaumont, Tex.—The contract for laying over 15 mis. of mains and laterals and installing a pumping and filtration system was awarded Feb. 13 to A. B. Sanders of Louisville for about $200,000.

Findlay, O.—The contract for the construction of a conduit 10 mis. long from the Limestone Ridge district has been awarded to the American Sewer Pipe Company at $1.30 a lin. ft. for vitrified pipe and $5,851 for vitrified specials.

West Bay City, Mich.—Bids were received Feb. 16 for furnishing 150 tons of c. i. water pipe as follows: Jas. Clements & Son; M. J. Drummond & Co.; J. D. Dimmick & Co.; Jas. B. Clough & Sons; R. C. Bialy and the United States Cast Iron Pipe and Foundry Company. The bid of the latter was accepted, as follows: 4-inch, $31.95; 6-inch, $30.95; 8-inch, $30.70; 10-inch, $30.45; 12-inch, $30.45; f. o. b. cars at West Bay City.

BRIDGES.

Elkton, Md.—A new bridge is proposed near Rising Sun.

Wheaton, Minn.—A bridge across Lake Traverse is proposed.

Bluffton, Ind.—Contracts will be let in March for fifteen new bridges.

Akron, O.—A new concrete arch bridge at Cuyahoga-st. is proposed.

Sterling, Ill.—A steel bridge across Rock river is contemplated.

Front Royal, Va.—A bridge is contemplated over the Shenandoah river at Carsons Ford.

Paris, Ky.—An iron bridge at the foot of Stoner-ave., over Stoner creek, is proposed.

Allegan, Mich.—A bridge across Kalamazoo river has been authorized. Co. bd. supvrs.

Kearny, Neb.—Bids are asked until March 17 for a bridge over Wood river. Bd. co. supvrs.

Roby, Tex.—Sealed bids are asked until March 9 for two iron bridges. Jesse Wright, co. judge.

Mason City, Ia.—(Special.)—A Portland cement concrete arch bridge will be built across Willow creek.

Schenectady, N. Y.—A bridge is proposed across Cotton Factory hollow. Chas. W. Trumbull, cy. engr.

Colville, Wash.—Bids will be received March 9 for a drawbridge over the Kalispel river. Co. comrs.

Hagerstown, Md.—The construction of an iron bridge across Beaver Creek is contemplated by the co. comrs.

Franklin, Ind.—Sealed bids are asked until March 7 for a bridge over Pruitt's Ford. Co. comrs. Johnson county.

Cartaret, N. J.—A new bridge across the Salt Meadows, between this town and South Cartaret, is contemplated.

Roby, Tex.—Sealed bids are asked until March 9 for building two iron bridges. Jesse Wright, county judge.

Franklin, Ind.—Bids are asked until March 7 for building a bridge over Sugar Creek at Pruitt's Ford. Co. comrs.

Plymouth, Wis.—Bids are asked until March 25 for building four stone and steel bridges. Elias Salsbury, chmn.

Freeport, Ill.—The impvt. committee has been authorized to build a bridge across Minnow creek on June-st.

Seward, Ill.—The question of building a bridge on the Kittleson and Shutliffe road was favorably voted on.

Ft. Wayne, Ind.—The construction of a steel viaduct over the railroad tracks on S. Calhoun-st. is proposed.

Macon, Ga.—The erection of five new iron bridges on the Houston road has been decided upon by the county comrs.

Madison, Wis.—A resolution has been passed by the cy. council to rebuild the bridge over the Yahara on Williamson-st.

Deland, Ill.—The village board has decided to build a new bridge across Grosse creek, east of their school house.

Lewiston, Wis.—A steel bridge across

Big Slough at Menominee House is contemplated. O. C. Cushman, chmn. bd. supvrs.

Plainwell, Mich.—Sealed bids will be received at 10 a. m. Mar. 10 for constructing a steel, cement or concrete steel bridge. Town board.

Redding, Cal.—Bids are asked until Mar. 4 for a stringer highway bridge over Pitt river at "Pike's Bridge." W. O. Blodgett, co. clk.

Missoula, Mont.—Surveys for a new bridge across the Missouri river, from Van Buren-ave. to John-st., have been completed. E. Hughes, surv.

Weiser, Idaho—An appropriation of $15,000 has been recommended to aid in the construction of a steel bridge across Snake river.

Chatham, Ont.—Bids are asked until Mar. 26 for a steel swing bridge over River Sydenham at Tuppeville. A. McArthur, twp. clk.

Washington, D. C.—Sealed bids are asked until Mar. 27 for building a highway bridge across the Potomac river. Chas. J. Allen, Lt. Col. Engrs.

New York City.—Plans for the proposed Manhattan bridge, across East River, have been filed. It will be the largest bridge in this city.

Chicago, Ill.—Sealed bids are asked until Mar. 9 for building in place the concrete south pier at Superior Entry. D. D. Gaillard, capt, engrs.

Columbus, O.—The residents on the east side are agitating the question of erecting a steel foot bridge over the Penn. tracks at 20th-st.

Chicago, Ill.—Sealed bids are asked until 2 p. m. Mar. 18 for designs for a bridge in Jackson park. E. G. Shumway, secy. South Park comrs.

Milwaukee, Wic.—Bids are asked until March 6 for a highway bridge across the No. Menominee canal at Muskego-ave. Charles J. Poetsch, chmn. comrs. pub. wks.

Charleston, Mo.—Bids are asked until March 7 for erecting a bridge across the Fish lake ditch on the Charleston and Rush Ridge road. C. S. Reynolds, road and bd. comr.

Columbia City, Ind.—Sealed bids are asked until March 11 for constructing steel bridges, stone and concrete culverts. Robert B. Boyd, chmn. co. comrs.; Charles E. Lancaster, co. audt.

Atlantic City, N. J.—Bids are asked until March 4 for building a duplicate steel drawbridge on the new highway from Pleasantville to this city. J. J. Albertson, co. engr. Magnolia, N. J.

St. Paul, Minn.—Sealed bids are asked until March 7 for 12 steel Tainter sluice gates and accessories, and steel hinges and accessories for one Bear Trap log sluice gate. Mayor R. L. Hoxie.

Columbia City, Ind.—Bids are asked until March 11 for constructing one 24-ft. stone culvert, two 22-ft. stone culverts, one 26-ft. stone culvert, one 32-ft. stone culvert, one 24-ft. concrete culvert, two steel bridges. Bd. co. comrs.

Peoria, Ill.—Sealed bids are asked until 12 m. March 3 for the erection of a 65-ft. span bridge over Farm creek on the East Peoria road. Plans and specifications can be seen in the office of the cy. engr. Bids will also be received from any bidder wishing to submit plans and specifications of his own accompanied by a bona fide bid. R. M. Orr, clk.

Cedar Rapids, Ia.—(Special)—J. D. Wardle, ch. engr. Cedar Rapids, Iowa & Southern Railway, says that company will build three river bridges, one across the Cedar river at Cedar Rapids, one across the Iowa river at Iowa City and one across the Iowa river at Curtis. These bridges will require four 150-ft. spans, and four 125-ft. spans. The work will all be done by contract; estimates are being made on the electrical equipment.

STREET LIGHTING.

Belvidere, Ill.—A municipal electric light plant is proposed.

Saginaw, Mich.—A municipal lighting plant is again proposed. W. H. Barton, cy. clk.

Alexandria, Va.—An incandescent electric light plant is contemplated.

Janesville, Wis.—Municipal ownership of the electric light plant is proposed.

Forrest, Ill.—The question of a new electric light plant may be voted on.

Mitchell, S. D.—The question of a municipal electric light plant will be considered.

Sheboygan, Wis.—The construction of a municipal electric light plant is proposed.

Scotland, S. D.—V. B. Diehl and Fred Becker have applied for a franchise for a city gas lighting system.

Atwood, Ill.—A stock company is being formed by local men for the purchase of the electric light plant.

Muncie, Ind.—The municipal electric plant will be remodeled and an additional boiler and dynamo put in.

Duiuth, Minn.—A resolution has been introduced to establish a municipal electric light plant.

Bowling Green, Ky.—The question of a municipal electric light plant is being agitated.

Benton Harbor, Mich.—The question of establishing a municipal lighting plant will be voted on in the spring.

Lind, Wash.—The Lind Electric Light Company has asked for a franchise for putting in an electric light and power plant.

Bowling Green, Ky.—The committee appointed to investigate the proposed municipal lighting plan has reported favorably.

York, Pa.—A contract has been awarded the Merchants' Electric Light Company for lighting the boro. of North York.

Augusta, Ark.—The contract for an electric light plant was awarded to P. H. Porter of Clinton, Ky., for $11,713.

Ensfield, Conn.—The selectmen are considering plans for charging the present arc lighting system to the incandescent system.

Mankato, Minn.—The contract for street lighting in Brooklyn, a suburb, has been awarded the Mankato Gas and Electric Company.

Greencastle, Ind.—Plans are being prepared for an electric light plant and bids will be asked soon. Putnam Electric Company.

Saginaw, Mich.—City Engineer Roberts was directed Feb. 19 to make plans and specifications for a municipal light plant.

Falmouth, Ky.—A contract has been awarded the Sun Vapor Light Company of Canton, O., for 40 70 c. p. gasoline street lamps.

Ft. Stevens, Ore.—Bids are asked until March 6 for constructing an electric light plant. F. H. Hathaway, Q. M., Vancouver Barracks.

Sebree, Ky.—Harold L. Davidson desires to correspond with contractors furnishing a complete plant for lighting a town of 2,000.

Chanute, Kas.—The contract for constructing a municipal electric lighting plant will be let about Mar. 1, according to press reports.

Taylor, Tex.—A contract has been

awarded the Taylor Electrical Light Company for 67 street lights at $75 per light per month for four years.

Youngstown, O.—A proposition from the Cleveland Vapor Light Company of Cleveland to put in 50 incandescent gas lights has been accepted.

Shelbyville, Ind.—Chairman Gadbois of the committee on lighting streets has recommended an appropriation of $58,000 for lighting streets.

Prince Albert, N. W. T.—Bids are asked until March 16 for electrical machinery, boiler, engine, etc., for an electric light plant. A. K. Roff, cy. recorder.

Oneida, N. Y.—Bids will probably be invited April 1 for constructing an electric light plant at Lime Kiln Falls. De Witt C. Hancock interested.

Nashville, Tenn.—The contract for a new engine for the electric light plant was awarded to the Bullock Electrical Mfg. Co., for $5,615.

The question of issuing bonds for constructing electric light plants has been favorably voted on at Fertile, Minn., and Springville, Utah.

Fremont, Neb.—L. D. Richards and Fred W. Vaughn have asked for a franchise to install a subway and conduit system under the streets and alleys for pipes, mains and wires.

Washington, D. C.—Bids will be received until Mar. 10 for the installation of a conduit and electric wiring system in the United States postoffice at Wilkesbarre, Pa. P. O. Dept., Washington, D. C.

Burlington, Vt.—The special aldermen's committee on municipal lighting voted Feb. 13 to instruct the secretary to communicate with various authorities to ascertain the cost and feasibility of operating an electric light plant.

St. Paul, Minn.—Paul Martin, G. C. Knispel, F. B. Doran and W. R. Sasche have been appointed a committee to investigate the feasibility of installing an electric plant to furnish power to various West Side industries.

Springfield, Ill.—A syndicate of eastern capitalists have secured options on the gas plant, the City Railway Company, the Springfield Light, Heat and Power Company and the Springfield Hot Water Heating Company of this city.

The construction of electric light plants is contemplated at the following places: Brookport, Ky.; White Lake, S. D.; Mendon, Ill.; Douglas, Ga.; Wilmerding, Pa.; White Lake, S. D.; Gretna, La.; Danville, Ky.

The question of issuing bonds for electric light plants will be voted on as follows: Emmons, Minn., Mar.; Rushville, Ill., Mar. 10; Dexter, Mich., Mar. 8; Rich Hill, Mo., Mar. 10; Schoolcraft, Mich., Mar. 9; Waxahachie, Tex., April 7.

Portland, Me.—Bids for furnishing 3 engines and generators for an electric light and power plant were received Feb. 3 as follows: W. A. Harris, $1,950 each; Jarvis Engineering Company, $2,096 each; Ball Engine Company, $5,800 for three; Harrisburg Foundry and Machine Company, $6,500 for three; Chase, Shawmut Company, $2,550 each for turbine engines. On generators the bids were as follows. General Electric Company, $925 each; Sprague Electric Company, $1,025 each; Crocker-Wheeler Company, $1,170 each; Bullock Electric Company, $1,042 each; Westinghouse Electric Mfg. Company, $8,200 for three.

PARKS.

Cincinnati, O.—This city will expend $1,000,000 for the extension of the park system.

St. Joseph, Mo.—It is estimated that $20,000 will be needed this year to maintain the parks in this city.

Kansas City, Mo.—The park board estimates that $1,000,000 will be required to improve the park land now owned by this city, and an effort will be made to have the city council submit the proposition to issue bonds to vote.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

St. Joseph, Mo.—The bd. of health is considering a franchise for the disposal of garbage.

Orange, N. J.—The bd. of health has asked that steps be taken to erect a garbage crematory.

Kansas City, Mo.—Bids were submitted Feb. 20 for the disposal of garbage, but action was deferred.

Kalamazoo, Mich.—The question of purchasing a garbage crematory is being considered. E. W. Buckley, cy. engr.

Omaha, Neb.—The cy. coun. recommended Feb. 10 that estimates be made for the construction of a garbage crematory.

Niagara Falls, N. Y.—The common council is in favor of the contract plan for the collection and disposal of garbage instead of the present system.

St. Paul, Minn.—A contract with the Austin & Western Co. of Chicago for new equipment for the sprinkling plant is favored by the committee on streets.

Rockford, Ill.—The contract for the collection and care of garbage was awarded Feb. 1 to J. A. Peterson of this city for $2,400. The contract is for eight months.

FIRE APPARATUS.

Baltimore, Md.—A truck, four hose wagons and two steam fire engines will be purchased.

Westfield, N. J.—The fire department is agitating the question of purchasing a steam fire engine.

Freeport, Ill.—The fire committee has been authorized to purchase 500 ft. of 2½-in. cotton hose.

Gonzales, Tex.—The question of issuing $8,000 bonds for the fire department will be voted on March 3.

Pasadena, Cal.—Sealed bids will be received until March 10 for nine fire plugs. Heman Dyer, cy. clk.

Colorado Springs, Col.—The council voted to appropriate $3,000 for establishing a patrol alarm system.

Milwaukee, Wis.—A resolution was introduced Feb. 9 providing for the purchase of a new fire alarm system.

Pasadena, Cal.—Sealed bids are asked until March 2 for constructing a fire engine house. Heman Dyer, cy. clk.

Chatham, N. J.—A fire alarm whistle will be purchased for the electric light station, and a fire alarm system will be established throughout the borough.

Tacoma, Wash.—Fire Chief Poyns recommended in his recent annual report the purchase of a new steam fire engine, a new combination chemical engine and hose wagon.